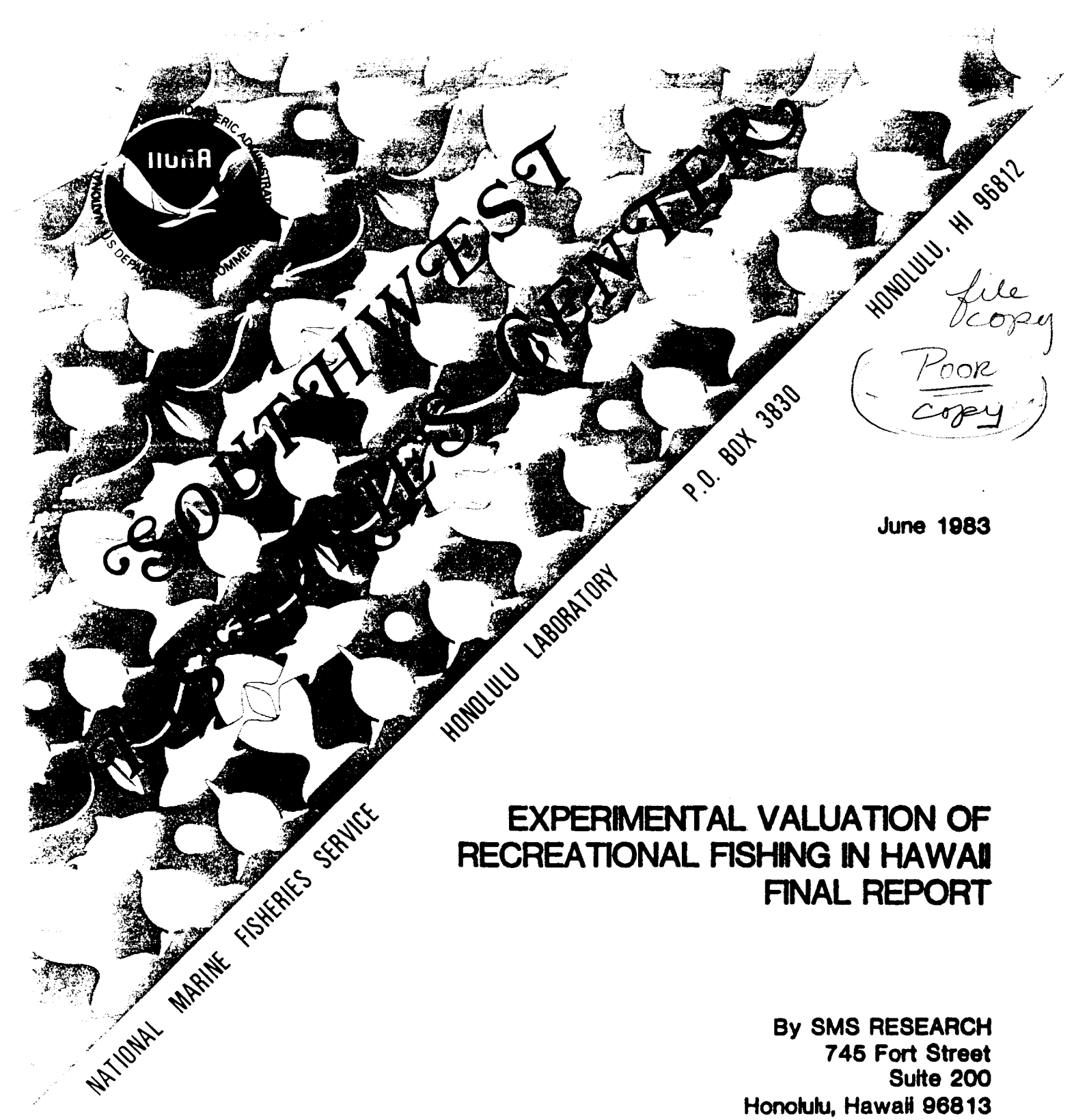

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EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII FINAL REPORT

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PREFACE

This study was prepared by SMS Research of Honolulu with Karl Samples, Professor of Resource Economics at the University of Hawaii, Honolulu, as the chief investigator. The contract objective was to test the feasibility of estimating the economic value of offshore recreational fishing in Hawaii. The study involved testing a variety of survey techniques to measure consumer surplus, gross expenditures, and responsiveness of recreational anglers to changing catch rates. The study builds on theoretical work undertaken by the National Marine Fisheries Service, NOAA and university economists across the nation in developing new means for properly analyzing the tradeoffs involved in fisheries management and development and in environmental assessment. Although the study reports quantitative results, these are not considered representative. Further field work is required before definitive estimates of recreational fishing values will be available in Hawaii. Because the report has been prepared under contract (82-ABC-00251), its statements, findings, conclusions, and recommendations are those of the contractor and do not necessarily reflect the view of the National Marine Fisheries Service.

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INTRODUCTION

Offshore recreational fishing in Hawaii is a popular pasttime for a significant number of residents throughout the state. Attracted by the possibilities of fighting and landing large gamefish, and by the availability of recently constructed boat launching facilities, Hawaii's offshore recreational fishing fleet has expanded to include an estimated 3,500 trailered and permanently moored vessels. Although the number of individuals currently engaged in offshore recreational fishing is uncertain, data collected in 1968 indicated that the offshore angling population numbered just under 15,000 persons (Hoffman and Yamauchi). Evidence suggests that offshore anglers are also particularly enthusiastic about their sport. For example, it has been calculated that approximately 100,000 individual offshore recreational fishing trips targeted in catching billfish, tuna, mahimahi and ono were taken in 1976 (Research Associates).

In light of the popularity of offshore recreational fishing in Hawaii, there is reason to suspect that the sport generates sizeable economic and social benefits for participants, as well as for the state as a whole. Three basic types of benefits can be identified. One benefit, which also has biological implications, stems from the landings of certain fish species by recreational fishermen. An illustration of the magnitude of offshore recreational catches in Hawaii is found in the fact that sport fishermen operating out of the Kailua-Kona area of the Island of Hawaii were responsible for landing nearly 600,000 pounds of marlin, tuna, ono and mahimahi in 1976 (Cooper and Adams). In most instances, recreational landings satisfy private households' protein demands. Surpluses are either given away as gifts or sold through established commercial fish marketing channels to generate supplementary household incomes. Regardless of actual disposition, the economic value of these catches is probably quite large, compared to the value of Hawaii's commercial finfish landings. In this regard, the estimated value of the 1976 Kailua-Kona recreational catch sold commercially (60 percent of the total) equaled approximately $260,000 (Cooper and Adams). Such a finding should not be viewed as unusual, especially in light of research findings which indicate recreational landings of finfish in the United States in 1970 were equivalent in terms of poundage to domestic commercial landings of finfish (United States Comptroller General). Economically significant recreational fish catches have also been reported for various geographical areas of the United States (see for example Ditton et al., Carls and Bresnan, and Cicin-Sain, Moore and Wyner). A more exact approximation of the magnitude and disposition of Hawaii's offshore recreational landings will be forthcoming with the publication of the results of the National Marine Fisheries Service (NMFS) "Marine Recreational Fishery Statistics Survey" (Human Sciences Research, Inc).

A second social value or benefit associated with offshore recreational fishing in Hawaii stems from the sizeable expenditures which anglers make on fishing vessels, food, tackle, fuel, beverages, accommodations, vessel repairs, berth rentals, and the like. The value of recreational expenditures is normally measured in terms of the additional income (or employment) that is generated in a specified geographical area as a result of the initial spending activities by anglers. In Hawaii, the financial impact of multiple respending could be quite large due to relatively high marginal propensities to consume on the part of residents (Ghali and Renaud). Consequently, the gross economic contribution of offshore anglers' fishing-related expenditures is undoubtedly non-trivial (Hoffman and Yamauchi). For example, using local income-expansion multipliers developed by Hoffman and Yamauchi, along with their 1969 estimate of offshore anglers' annual expenditures, a gross economic value of $2.6 million per year can be associated with the offshore recreational fishing that took place in Hawaii in 1969. The current expenditure value is probably different due to structural changes in the local economy over the last decade. However, there is reason to suspect that the value is at least of the same order of magnitude based on similar gross economic contribution values (calculated on a capita basis) which have been reported for other offshore recreational fisheries (see for example Samples and Bishop, 1981, and United States Department of Interior).

In addition to producing high quality fish for household consumption, stimulating employment, and encouraging further sales of goods and services within Hawaii's island economy, offshore recreational fishing produces another source of benefits for participants. These benefits, technically called "consumer surplus," represents the subjective value which anglers assign to their fishing activities, over the above opportunity costs associated with fishing. Stated differently, consumer surplus is the maximum amount which anglers would be willing to pay for offshore fishing opportunities (beyond their current expenditure levels) before they would stop fishing altogether. It is generally recognized by fishery economists that anglers' consumer surplus can represent a sizeable sum. For sport fishing in Wisconsin, annual consumer surplus was calculated to be $7.2 million compared to direct (not incorporating multiplier effects) expenditures of $17 million per year (Samples and Bishop, 1981). Although little is understood about the consumer surplus value of offshore recreational fishing in Hawaii, one study directed at the Kailua-Kona offshore fishery estimated an annual consumer surplus value of $1.8 million for a fleet of 380 vessels in 1976 (Adams). Similar comparative results (on a per trip basis) have been reported by Boland, Talhelm and others.

The stated purpose of this project was to test the feasibility of estimating the value of offshore recreational fishing in Hawaii. Specific objectives were to determine the practicality of estimating: (1) the gross economic impacts of offshore recreational fishing; (2) the consumer surplus value of offshore recreational fishing; and (3) the responsiveness of recreational values to changes in catch rates, levels of congestion and availability of recreational substitutes.

This report presents a description of the work performed in meeting these objectives. In the following section, survey procedures are discussed. In the third section, a statistical profile of surveyed anglers is presented and interpreted. This overview is followed by a description of our findings regarding application of alternative recreation valuation approaches. In the fifth section, the discussion centers on alternative tools for measuring the economic impact of offshore recreational fishing in Hawaii. Recommendations concerning questionnaire design and fielding, along with suggestions for economic impact measurement, are given in the final section of this report.

SURVEY PROCEDURES

Questionnaire Development

The survey instruments were designed and developed by both Dr. Karl Samples, Principal Investigator, and SMS Research, Inc. in conjunction with the National Marine Fisheries Service (NMFS).

The primary objective in tailoring the questionnaire was to test the practicality of applying various valuation approaches within the specific context of Hawaii's offshore recreational fishery. One aspect of this objective entailed determining which valuation techniques can be used to generate valuation estimates. A second aspect involves identifying sources and direction of biases (if any) in survey responses which may result in subsequent economic value estimation errors. Other objectives considered in questionnaire development include determination of: (1) respondents' ability to recall catch quantities and expenditure amounts; (2) respondents' willingness to participate in a personal interview survey, and (3) respondents' perceived importance of various quality attributes of offshore recreational fishing. As best as possible, the questionnaire was designed to accomplish these objectives within the context of 20 minute personal interviews.

Included in the survey instrument were questions relating to angler expenditures, fishing activities, and subjective valuation of offshore recreational fishing experiences. Information on angler expenditures is important because it provides the basis for economic impact assessment and travel cost demand estimation. Included were detailed questions on annual fixed and variable costs of fishing and cost imported equipment of boats. Questions were designed to permit evaluation of respondents' ability to recall and categorize expenditures for the previous year, as well as the fishing trip just completed.

Questions relating to fishing activities included those concerned with identifying launching sites used, desired characteristics of launching sites, reasons for traveling to certain launching sites rather than others, number of fishing trips taken, annual catch (poundage and number) by species, disposition, and proportion caught near a Fish Agregating Device (FAD). Questions were designed to test respondents' recollection of fishing activity data, and to detect possible multiple-purpose trip and launching site quality biases which could influence travel-cost demand estimates.

Considerable attention was given to developing sets of questions useful in guiding subsequent work on recreational valuation. To begin, the survey included a series of questions on respondents' subjective perceptions of the relative importance of offshore sportfishing vis-a-vis other recreational pursuits. Questions concerning anglers' attitudes about changes in catch rates and congestion levels were also included.

Twelve different question formats were developed to measure angler responses to hypothetical valuation inquiries. Six of these questions related to valuing a single day of fishing while the remaining six related to valuing an entire fishing season. Both sets of questions included the following formats:

(1) Willingness to pay (take-it-or-leave-it offers)

(2) Willingness to sell (take-it-or-leave-it offers)

(3) Willingness to pay (interative bidding game)

(4) Willingness to sell (interactive bidding game)

(5) Willingness to pay (open-ended format)

(6) Willingness to sell (open-ended format)

The question set was designed to test for the following issues: (1) internal consistency between responses; (2) consistency between estimated values of a fishing day versus a fishing season; (3) question format biases; (4) upper range of individual valuation; and (5) starting point biases in bidding games.

The development of the instrument (in its several versions) was considerably more involved than originally anticipated. The development process involved three different stages of pretesting, with the final stage featuring six pretest interviews conducted with six fishermen at Keehi Boat Harbor. Each stage involved substantial instrument revision.

It was particularly challenging to reduce the time needed to administer an interview which originally ranged up to an hour in length when administered to actual fishermen who had to ponder their replies. The solution adopted was to split the fishing activity and characteristics questions into two sets to be administered in two different versions of the instrument. Certain questions in the longer of the two versions were again divided into subsets, to be administered separately to different

sub-versions. The two basic versions of the questionnaire also featured two sets of recreational fishing valuation questions to be independently tested. The "split sample" approach was considered appropriate because the main objective of this pilot study was to test the questions and instrument.

A second challenge was to improve and simplify the wording of the scenarios used in the recreational fishing valuation questions. The need for this emerged as a result of the third round of pretesting. The wording that emerged sought to preserve the main features of the scenario while taking into account the impatience of fishermen respondents.

The final challenge in design was to clarify the instructions for the "take-it-or-leave-it" and "bidding" questions. These instructions will be put on cards for field use. As an aid to clarity, "tree" diagrams for the "bidding" questions were developed that showed the sequence of stimuli and the resulting range of accuracy for final estimates.

The basic questionnaire versions are in Appendix A. Alternative subsets of questions that were included in different versions of the basic questionnaire are also given.

Sample Design

The sample consisted of 100 recreational fishing vessel owners launching trailered boats at Waianae (Pokai Bay) Small Boat Harbor during Spring, 1983. For a variety of reasons, this sample was probably unrepresentative of the total offshore sportfishing population in Hawaii. For example, it likely did not include anglers who prefer to launch their boats at alternative launching sites on Oahu. By design it did not include owners of permanently moored fishing boats who do not trailer their boats to launching sites. Furthermore, because the interviews were conducted with vessel owners (or owner surrogates), no attention was devoted to interviewing passengers or dockside spectators who partake of sportfishing in a vicarious fashion.

Concentrating survey efforts on an isolated geographical area and on a select group of sportfishing beneficiaries did have certain scientific advantages by creating a relatively homogenous study group. Increased homgeneity of the sample reduced overall variances in survey responses and allowed for less ambiguous evaluation of questionnaire design features. This feature also allowed for comparative evaluation of survey responses between respondents and hence increased the degree to which a variety of question formats can be tested.

The overall sample of 100 anglers was further divided into two subsamples comprised of 50 anglers each. This procedure

allowed for more questionnaires format to be fielded without making individual interviews longer than 20 minutes to complete. Anglers comprising subsample I were queried about their vessel characteristics, frequency of use of alternative launching sites, total catch, valuation of a fishing day, and basic demographic characteristics. Anglers included in subsample II were asked questions relating to trip variable costs, costs associated with fishing during 1982, attitudes about fishing and fishing quality, valuation of a fishing season, and basic demographic characteristics.

Data Collection

Interviewers selected for this pilot study were trained and experienced SMS Research personnel. As part of standard procedure, each interviewer attended a special training session to acquaint him with the instrument, procedures, and special instructions appropriate to this study. Training included an item-by-item review of each version of the survey instrument along with refreshment in general intercept interviewing techniques.

A letter of introduction from NMFS was provided to all SMS interviewers. The letter served to validate the authenticity of the study, to describe the purpose and objectives, and to aid in soliciting participation among respondents.

The NMFS Laboratory sent out letters to the following key persons in order to provide them with knowledge regarding the survey prior to it being fielded:

Ms. Alana McKinney, Charter Captain, HFN Assoc. Editor

Mr. "Uncle" Paul Blakeman, notable Waianae fishing resident

Mr. Glenn Nishihara, President - Hawaii Fishing Coalition

Mr. Winfred Ho, Board of Governors, HIATT

Mr. Henry Sakuda, Dept. of Land & Natural Resources

Letters to Ms. McKinney and Mr. Blakeman may have allowed them to provide Waianae fishermen with sufficient notice and information about the study.

The survey was conducted between April 27 and May 7, 1983 at the Waianae (Pokai Bay) Small Boat Harbor. Interviews were conducted between 9:00 a.m. and 7:00 p.m. The majority of respondents were interviewed at the "wash area" of the parking

lot. This area was deemed to be convenient for both interviewers as well as respondents.

All respondents were qualified as recreational fishermen prior to conduct of the survey. Fishermen who went out for commercial purposes were not included in the survey.

Immediately following the conduct of the surveys, all interviewers attended a debriefing session at SMS Research. Interviewers were asked to comment on the administration of the instrument, effectiveness/appropriateness of specific questions, participation among fishermen and any related problems or events that occurred in the field. This information proved to be very valuable in a pilot or test situation. Results of the debriefing session are presented as part of the Recommendation section in this report.

All completed questionnaires were edited and coded by SMS staff members. Editing included checking for completeness, the following of proper skip patterns, and follow-up encouraging multiple responses on appropriate questions. Open-ended questions were coded, placing responses into appropriate categories.

The edited/coded questionnaires were keypunched onto a magnetic tape and 100 percent key-verified. Keypunched data were checked by special SMS software to detect logic and keypunch errors. The resulting tape served as the basis for all income-expansion analysis performed on this study.

STATISTICAL PROFILE OF RESPONDENTS

Statistical Comparisons of Sub-Samples

As noted above, two almost totally different questionnaire instruments were fielded to two separate subsamples. This split sampling approach created a need to determine whether individuals included in the two subsamples exhibit similar characteristics as if they all came from the same underlying population. The questionnaire instruments were intentionally designed to allow statistical comparisons between the two subsample groups. Four questions relating to ownership status, income, age, and employment status were asked of both subsamples. Sex of respondents was also recorded for all interviewees. Data obtained for these variables for the two subsamples are given in Tables 1-12.

Two-tailed t-tests were used to measure the degree of statistical similarity between the two subsamples. Results of the statistical tests are given in Appendix C. At the 95 percent confidence level (N=50), the hypotheses could not be rejected that age and income class proportionality, sex proportionality, proportion of interviewees who were skippers versus owners, proportion of employed persons, and proportions of certain job occupations were the same between the two subsamples.

Taken together, these comparisons strongly suggest that the two questionnaire intruments were likely administered to anglers drawn from the same underlying population of offshore recreational fishermen. Consequently, the analysis which follows treats both sample groups as statistically homogeneous.

Demographic Characteristics

With the exception of one interviewee, all respondents were male. Respondent ages ranged from 18 years to over 65 years. The mean age category observed was 35-44 years. A majority of respondents (84 percent) were currently employed. The most frequently reported occupations were "professional," "service," and "structural." Annual income of respondents was highly variable ranging from less than $5,000 to over $40,000. The median reported annual income category was $20,001 to $30,000. Five percent of the total survey group reported annual incomes less than $10,000 and four percent reported incomes exceeding $40,000.

Fishing Activity Characteristics

Extensive data were collected on respondents' fishing activity levels, catch rates, motivations and fishing-related costs. Most questions related specifically to offshore recreational sportfishing. However, certain data (such as those pertaining to vessel characteristics) reflect the fact that some sampled anglers are also engaged in commercial fishing activities. Of the fifty anglers queried about their status as commercial fishermen, 40 percent claimed to be licensed (Table 13). Of this group, 22 percent had sold fish during the past twelve months (Table 14). Due to the nature of the small sample size, the influence of commercial fishing status on anglers' responses is impossible to statistically evaluate.

Vessel Characteristics

Almost all (92 percent) of the respondents owned the vessels they were using at the time of the interview (Table 15). Most (94 percent) had owned their boats for five years or less (Table 16). All boats used by respondents were less than or equal to 28 feet in length (Table 17). Four boats were in the 13 to 15 foot range. Typically, vessel lengths were between 16 and 25 feet.

Initial cost of boats was reported to range from less than $1,000 to between $20,000 and $30,000. Most (86 percent) of the boats were purchased for an amount between $1,000 and $20,000 (Table 18).

As a result of the size of vessels used in the fishery, fuel use rates were relatively small (1-4 gallons per hour). Respondents were generally aware of fuel use rates for their own boats. Only four percent of the sampled group indicated that they did not know this information (Table 19).

Considerable variation was observed in the frequency of offshore fishing trips reportedly taken each year by respondents (Table 20). The number of trips taken during the previous 12 months ranged from one to 180; the average being about 45 trips. Over half (56 percent) of the sample took less than 40 offshore fishing trips during the previous year and 12 percent took over 100 trips.

Nearly all (92 percent) of respondents reported that primary purpose of their "fishing trips" was for fishing (Table 21). This result ws corroborated by the finding that only four percent of the survey group had engaged in non-fishing related activities on their current trip (Table 22). Presumably, other activities

might include commercial fishing and other forms of recreation. Diving and other pleasure boating were mentioned by two anglers as activities which they had engaged in during their current trip (Table 23).

Respondents were asked about the typs of records they keep on fishing activities (Table 24). Approximately a third of the group kept records on: (1) number of trips taken, (2) hours at sea, and (3) types of fish caught. Between 40 and 50 percent of anglers kept records on: (1) engine running time, (2) number of fish caught, and (3) fishing related catch.

Catch Characteristics

When asked to provide estimates of the number of various fish types landed during the previous twelve months, all surveyed anglers provided numerical catch estimates (Reported catch data are summarized in Table 25). No refusals or "Don't know" responses were recorded. Often, the catch numbers provided by anglers were multiples of 5 or 10, indicating that the numbers are probably rough estimates at best. More accurate catch statistics could probably be gleaned from boat records. Approximately 40 anglers surveyed anglers reported that they maintained records on numbers and types of fish caught. Unfortunately, in a personal interview setting, it is difficult to utilize historical catch records. Perhaps leaving a form with respondents to complete (and return by mail) may be a way of utilizing angler catch records more effectively.

Relatively small catches were reported for shark and individual marlin species. Perhaps these species can be combined into a single catch category to simplify and improve accuracy of catch data collection.

Nearly 84 percent of the survey group reported fishing within half a mile of fish aggregating devices (FADs). When asked to estimate the percentage of trips that involved at least some FAD fishing activity, about five percent of the group claimed they did not know. Of those who offered usable estimates, the mean value observed was 35 percent. Over a third of all fish types, except ono, mahi, and bottomfish, were caught near FADs.

Fishermen willingly stated the percentage of the fish catch that was sold commercially. No refusal or "Don't know" responses were recorded. Survey data do not enable an estimate to be made as to whether fish sold commercially were caught while recreational fishing. Future studies should clarify this issue. One possible way may be to ask fishermen to state the purpose of their intercepted trip, and identify their disposition plans for their current catch.

Importance of Fishing

In terms of amount of time spent offshore fishing since they first began, a slight majority (58 percent) of respondents indicated they had changed their fishing behavior (Table 26). The proportion of anglers reporting an increase in trips (28 percent) was not significantly different from the proportion of anglers reporting a decrease in fishing activity (30 percent).

Eighty percent of the survey group reported that they would miss offshore fishing a lot if it was no longer available. A much smaller group of anglers (18 percent) would miss fishing "somewhat" or "only a little" (Table 27). The most commonly mentioned specific substitutes for offshore sport fishing were shore fishing, diving, and hunting (Table 28).

Crowding at launch sites and fishing areas appear to affect the satisfaction level of a majority of angler respondents. Nearly 75 percent of the survey group indicated that their satisfaction would change "alot" or "somewhat" if congestion was somehow reduced (Table 29). Some anglers (four percent) stated they would be willing to travel over 50 miles to reach an uncrowded fishing location. A majority (56 percent), however, would be willing to travel less than 10 miles at the most to reach an uncrowded location (Table 30).

Many anglers (66 percent) reported that they would respond to a 50 percent change in catch rates by altering frequency of their fishing grips (Table 31). A majority (60 percent) claimed they would take less trips.

Response was mixed about how many fewer trips would be taken. One angler claimed he would quit fishing altogether. Less than 10 percent indicated they would cut back fishing activities by over 50 percent if catch rates were halved for some reason. A slight majority (53 percent) of anglers reported they would reduce fishing activities by 30 percent or less (Table 32).

Fishing Cost Characteristics

Travel Behavior

All respondents who were queried about launch site selection behavior reported that Pokai Bay was a "usual" launch site. Other frequently used launch sites mentioned used included Kaneohe, Keehi, Hawaii Kai, Haleiwa, and Ala Wai (Table 33). These data suggest that some degree of substitution may exist among different launch sites. However, the majority of anglers who visit Pokai Bay tend to launch their boat regularly at that location.

In selecting a launch site, the deciding factors which a majority of anglers reported as being important include: (1) "closeness to home"; (2) "closeness to good fishing"; (3) "good launch facilities"; (4) "good weather"; and (4) "uncrowded launch" (Table 34). Non-fishing related factors such as: (1) "scenic drive"; (2) "closeness to friends and relatives"; and (3) "good food and beverage stores nearby," were mentioned as being important by 40 percent or less of respondents. When asked to identify the single most important factor considered in fishing launch site selection, 48 percent of anglers mentioned "closeness to good fishing." Other factors that were ranked high by 10 to 20 percent of the sample were "closeness to home," "good launch facilities," and "good weather."

Reported distances traveled to reach the Pokai Bay launch site ranged from one to 60 miles (Table 35). The mean distance traveled was 16.7 miles and the standard deviation around the mean was 16.4 miles. Many respondents traveled very short distances, 46 percent reached Pokai Bay after less than five miles of road travel. In terms of travel time, a slight majority (56 percent) spent less than 30 minutes in travel. On the other hand, 28 percent reported spending 1-2 hours in travel time (Table 36).

After reaching their Pokai Bay destination, anglers generally traveled at least a short distance by boat before beginning to fish (Table 37). The mean distance anglers reportedly traveled by boat before fishing was 3.2 miles. A third of the sample group began fishing immediately after leaving the Pokai Bay vicinity. Only 16 percent traveled over five miles by boat before beginning to actively fish. Survey data suggest this behavior may not be typical of anglers fishing out of other launch locations. Specifically, 76 percent of respondents reported that the distance they usually traveled before fishing depends on the launch site (Table 38).

Including time spent reaching fishing locations, anglers reportedly spend between one and 22 hours at sea during the intercepted trip. A large majority (86 percent) of trips lasted between four and nine hours (Table 39). Overall, the mean trip length was 7.3 hours and the standard deviation was 3.07 hours.

In terms of average total trip length, surveyed anglers spend approximately eight hours. Of this amount, 12 percent of the time was spent traveling to and from Pokai Bay. The remaining time was allocated to reaching and returning from the offshore fishing site, and in actual fishing activities.

Fishing Expenses

Respondents were asked to recollect specific fishing-related

costs for their current trip, as well as for certain expense incurred during the previous 12 months. A summary of anglers average annual expenditures for various items is given in Table 40. Average total costs per trip were estimated to be $104, assuming a trip frequency of 45.5 trips per annum. Of this amount, 52 percent ($55) represents direct out-of-pocket costs for fuel, oil, bait, ice, food, and beverages. The remaining 48 percent ($45) represents on average of annual expenses for repairs, tackle, licenses, insurance, and so forth. Average fuel and oil expenditures made to reach Pokai Bay was $8. This amount represents about eight percent of total trip costs and approximately 15 percent of anglers' average out-of-pocket travel expenses. The single largest average trip expense was $31 for boat fuel and oil.

Average annual fishing-related expenses totaled $4,780. This number is computed using the asumption that anglers spend $104 per trip (45.4 trips annually) on out-of-pocket expenses. Boat fuel and oil costs contribute 33 percent of the total. Truck fuel and oil costs represent on average nine percent of annual fishing-related costs.

No lodging costs were reportedly incurred by interviewees. This finding is consistent with the fact that only three percent of the survey group reported staying overnight in the Waianae area while on the current fishing trip (Table 41).

A majority (70 percent) of anglers reported sharing current out-of-pocket trip expenses with others in their fishing party. Respondents shared expenses with up to five other people. The median number of persons, who anglers claimed they shared expenses with, was three (Table 42).

Anglers were asked to give the amount of fishing-related purchases made directly from supply sources outside of Hawaii. The mean amount stated was $24. This amount is less than one half of one percent of total average annual expenditures (Table 43).

Considerable variation was observed in anglers' annual fishing expenses. Standard deviations of mean estimates were often three to four times the mean value. For example, reported annual expenditures on haul-out charges ranged from zero to $5,600. The mean value was $342 and standard deviation was $1,116. Similarly, wide variations were noted in values reported for safety equipment expenditures, engine repair costs, and radio and navigation purchases, among others.

Considerably less variability was observed in anglers' reported out-of-pocket expenses for the current trip. This may be due to increased accuracy in respondents' ability to recall recent expenses. It may also reflect the fact that out-of-pocket

expenses are somewhat unavoidable and are not particularly sensitive to travel distance. By comparison, reported expenditures on improving or repairing boats or fishing equipment may reflect anglers' discretionary spending behavior.

EXPERIMENTAL VALUATION FINDINGS

Overview of Valuation Approaches

A variety of procedures have been developed for determining the social value of recreational fisheries, some of which are more straightforward than others (Spargo). Looking first at the problem of estimating the gross economic impact of offshore sport fishing, two procedures can be used, both of which entail collecting detailed expenditure data from anglers. The first precedure involves using secondary economic data to contruct income expansion multipliers. Estimated multipliers can then be used to measure the long-term impact of offshore fisheries related expenditures. Provided that the effects of income leakages are included in the multiplier formulation, this procedure is useful in yielding estimates of gross economic impacts on a local or statewide basis. The alternative is to use a modified version of Hawaii's multi-sector input/output model to estimate gross economic impacts on a statewide basis. Both procedures are consistent with methods employed in a wide range of recreational valuation settings (Leitch and Scott).

Estimating the net economic benefits (consumer surplus) associated with offshore recreational fishing in Hawaii could perhaps be accomplished using the travel cost and hypothetical valuation (contingent valuation) techniques. Considerable research has been conducted on the travel cost method of recreational valuation since its introduction. Notable refinements include: (1) inclusion of travel time and congestion levels in the model specification; (2) inclusion of the effects of substitute recreational activities in model formulation; (3) use of individual rather than aggregated observations in equation estimation, and (4) adjustment for multi-purpose trips. Despite these developments, the travel cost method is still under scrutiny by some who consider the technique to be invalid in principle (Bockstael and McConnell). Aside from purely theoretical concerns, there are reasons to suspect the travel cost method may not be particularly useful in ascertaining angler consumer surplus in Hawaii. One problem relates to the fact that travel costs are probably not in and of themselves significant determinants in anglers' participation rates. Furthermore, because travel-related costs are relatively insignificant for Hawaii resident anglers, one would anticipate very little variations in travel costs between individuals. Consequently, recreational demand estimation may prove to be statistically impractical.

While applications of the travel cost method is widespread, use of hypothetical valuation techniques has also gained popular acceptance. For the case at hand, use of the hypothetical valuation approach would entail placing anglers in hypothetical situations designed to elicit their true valuation of offshore recreational fishing. Three basic questioning approaches could be used: (1) open-ended questions, (2) bidding games, and (3) take-it-or-leave-it offers. Each approach has its unique advantages and disadvantages, particularly in regard to strengths and directions of biases in elicited valuations (Samples, Schulze et al., Thayer).

It should be mentioned that techniques used to estimate anglers' consumer surplus discussed above can also be formulated to measure the economic consequences associated with exogenous pertubations in quality charactertistics of offshore recreational fishing experiences (see for example, Samples and Bishop, forthcoming; Vaughan and Russell). For instance, hypothetical valuation techniques can be used to measure the value to anglers of additional fish landings. Similarly, the costs associated with increasing congestion on offshore fishing grounds and in harbors can be evaluated. Collection of information on anglers' marginal valuations of recreational sport fishing quality increments and decrements is quite important given the dynamic character of Hawaii's offshore sport fishing.

Travel Cost Demand Estimation Findings

The travel cost approach to recreational demand estimation has been most successfully applied in contexts where: (1) recreational demand at a single site is being evaluated; (2) travel costs represent a large proportion of the total costs associated with recreating; (3) trips are taken with one primary objective in mind -- to visit the site in question for purposes of recreating; and (4) recreationists are fairly homogeneous in their tastes and preferences for the recreational experience being evaluated. Survey data collected at Pokai Bay indicate that all four conditions are probably not met in Hawaii.

Offshore recreational fishing occurs at many sites around the State. If one considers a launch location as a "fishing site," survey data show that sampled anglers regularly visit at least six launch sites on Oahu. Furthermore, the launch areas do not seem to be perceived as homogeneous in terms of qaulity by interviewees. This is evidenced by the finding that a large majority (60 to 80 percent) of anglers mentioned launch characteristics (available facilities and degree of congestion) as important factors in launch site selection. Survey data were

not completed enough to determine the degree of substitutability between sites. However, it is clear that if the travel cost model is to be successfully applied, a multiple-site model should be used to account for perceived launch site quality differences.

A second, and perhaps more important concern about the potential application of the travel cost approach, is the relatively insignificant travel costs (mileage and time) observed in the Pokai Bay sample data. As noted above, travel costs for fuel and lodging to reach the launch site represent about eight percent of total trip costs and approximately 15 percent of anglers' average out-of-pocket travel expenses. Similarly, time costs associated with traveling to Pokai Bay represents only 12 percent of total trip time costs. In comparison, Samples and Bishop (1981) and Ditton, Graffe, and Lapotka reported travel-related costs (not including time) of offshore sport fishermen to be 45 to 55 percent of total annual fishing costs. The percentage of travel costs to direct out-of-pocket trip expenses was much higher (60 to 80 percent).

A crude test was conducted using sample data to determine whether travel distance to the Pokai Bay launch (a surrogate variable for time and mileage costs) was correlated with frequency of fishing trips taken per annum. Following normal travel-cost estimation assumptions, it was hypothesized that the correlation between trips and distance would be negative and significantly different from zero. The estimated simple correlation coefficient (N=50) was .23. A test of the coefficient's statistical significance at the 95 percent confidence level could not support the hypothesis that the estimated correlation coefficient was different from zero. The calculated t-value in this case was 1.81. This result casts some doubts on the negative impact of travel costs on anglers' demand for fishing trips.

Survey data suggest that for the most part, anglers took "fishing trips" primarily to be able to fish. Side visits to relatives', or opportunities to enjoy Hawaii's scenery do not appear to weigh heavily in anglers' launch site selection. Nevertheless, of the sample group, 32 percent and 14 percent mentioned "closeness to friends and relatives" and "scenic drive," respectively, as important factors in selecting a boat launch site. These findings suggest that some multiple-purpose trips are probably taken by anglers, a feature which the travel cost model is not particularly well suited to deal with.

Anglers interviewed at Pokai Bay appear to be a fairly homogeneous group in terms of their attraction for offshore sportfishing, types of boats owned, and sex composition. Considerable variation was observed in respondents' substitute

recreational opportunities, fishing activity levels, and fishing expenditure behavior, and income levels. Due to these and other undetected differences, estimation of travel cost demand equations using individuals as the units of observation may prove to be exceedingly difficult.

Hypothetical Valuation Findings

Open-Ended Questions

As the name suggests, open-ended questions provide no information to the respondent about the anticipated value which is being measured. Aside from the general hypothetical framework of the question, the respondent is not guided in his or her response. The question format simulates a market situation similar to a closed bid auction where buyers have no information about other potential buyers' bids, and have no clear understanding of the seller's desired disposition price.

Four different open-ended questions were experimented with in the Pokai Bay interviews. Two questions were designed to measure anglers' consumer surplus per fishing trip. These questions were asked to 50 anglers comprising subsample I. The first of the two questions measured anglers' willingness to pay a "fair price" for a daily launch fee:

> "Hawaii does not charge a daily launch fee. Suppose, however, that one was planned. What do you think would be a fair price to charge fishermen to fish for one day offshore?"

The second question measured anglers' willingness to accept compensation to forego a day of fishing:

> "Suppose that instead of offering a specific amount of money, he let you decide how much you would have to have. What is the smallest amount of money that would persuade you not to go offshore fishing as planned?"

Two additional open-ended questions were designed to measure anglers' consumer surplus per year. These two questions were asked to 50 anglers comprising subsample II. The first of the questions measure anglers' willingness to pay for a season fishing license:

> "Hawaii does not require offshore fishermen to purchase fishing licenses. But, suppose that a law requiring annual licenses was being planned. What do you think would be a fair price to charge fishermen for a license that allows them to fish offshore for one year?"

The second measured anglers' willingness to accept compensation

to forego a season of fishing:

> "Suppose that instead of offering you a certain amount of money, he let you decide how much you should have. What is the smallest amount of money that would persuade you to agree not to go fishing offshore during all of 1983?"

Tabulated responses to these four questions are given in Tables 44-47, respectively. Looking at the responses to each question in turn, only 38 anglers responded with a positive value to the boat launch fee question. The mean value reported by the 36 anglers was $3.76. Nearly 25 percent of the group either refused to answer or indicated they did not know a fair price. Twenty-eight percent of those responding reported a zero value. The maximum value stated was $50.

As expected, higher mean values were observed in anglers' stated minimum compensation to forgo a day of fishing (Table 45). In this instance, the estimated mean required compensation was $563, based on usable responses of 33 anglers. Once again, nearly a quarter of the sample group either refused to answer or claimed they did not know a proper dollar amount. Only eight percent reported a zero dollar compensation value. The maximum value stated was $50.

The second set of open-ended questions was asked to a different group of 50 anglers. These questions were concerned with valuing a season of fishing. The question which attempted to determine anglers' perception of a fair price for an annual fishing license yielded a mean value of $13.73 based on usable answers of 34 anglers who reported with positive dollar amounts (Table 46). Thirty-two percent of those queried refused to answer the question or did not know a proper answer. A zero value was given by 14 percent of the group. The maximum reported value was $50.

The final open-ended question generated still higher reported recreational fishing values (Table 47). The mean minimum compensation amount was $9,632, based on the response of 26 anglers. Nearly half (48 percent) of those surveyed either refused to answer or did not know a proper answer. Only four percent gave a value of zero. The highest value observed was $40,000.

The following observations can be made concerning the open-ended question results. First, the relatively high percentage (20 to 30 percent) of respondents who did not supply monetary value responses is disconcerting since the statistical validity of the mean value estimates are therefore suspect. Second, the high number of zero values reported for certain questions suggests that some anglers are not responding

accurately. Such a response may likely reflect a distaste or distrust of the hypothetical context of the question rather than a true monetary valuation. Third, the mean estimated values appear to be consistent in the sense that annual consumer surplus values are higher than per trip value estimates. That is, willingness to pay for a day of fishing (launch fee) is less than willingness to pay for a season of fishing (license fee). However, the values are not internally consistent when directly compared using an average trip frequency conversion constant of 45 trips per year. For example, at 45 trips per year, the $563 mean compensation value per trip expands to $23,335 of consumer surplus per year. This value is substantially higher (no statistical test conducted) than the $9,632 value calculated for annual consumer surplus in a separate question.

Bidding Games

Bidding game question formats differ from open-ended questions in two important ways. In a bidding game, respondents are provided an initial dollar value (bid) which can be accepted or rejected. Because an initial starting bid is given, information about the "true" or final value is revealed to the respondent. The manner in which this information affects the final bidding game outcome has been studied elsewhere by Thayer. A second difference in bidding games from open-ended questions is that bidding games entail more interaction between interviewer and respondent. When a respondent does not consider the initial bid amount acceptable in a bidding game, the interviewer incrementally (following a defined bidding schedule) raises or lowers the bid amount until a value is reached that is just marginally agreeable to the respondent. Through this interactive process, a respondent's minimum compensation amount or maximum willingness to pay is measured.

Eight different bidding game situations were experimented with, using four question formats. As in the case of the open-ended questions, two of the bidding game questions were designed to measure anglers' consumer surplus per trip. These two questions were asked to anglers comprising subsample I. Of the two trip-related questions, the first measures maximum willingness to pay for a special fuel tax:

> "Suppose that you were going to fill up your boat's fuel tank to go out fishing the next day. You hear that a new tax has been placed on fuel used for sportfishing. Would you go ahead and buy the fuel so that you could go fisning if the tax increased that cost of a fishing trip by $------?"

The other measured anglers' willingness to accept compensation to forgo a day of fishing:

"Finally, imagine that the day before you are planning to go offshore sportfishing, you find out that all sportfishing trips for the next day will have to be cancelled because of top secret Navy operations. However, you will get a cash reward to make up for the trouble caused you. Would you be satisfied with a cash reward of $------ if you could not go offshore sportfishing as planned?"

Two additional bidding game questions were designed to measure the amount of angler consumer surplus received per year. These two questions were asked to anglers comprising subsample II. The first question attempted to measure respondents' willingness to pay an annual user fee:

"Suppose that the Federal Government just passed a law that required all boat users to pay an annual user fee. Would you go ahead and pay the annual tax so that you could go offshore fishing in 1983 if the amount which you had to pay was set at $------?"

The second measured anglers' willingness to accept a compensatory amount to forego fishing for one year:

"Finally, suppose that the government asked you to stop fishing for the rest of 1983. In return, you will receive a cash award. Would you go along and not go offshore fishing in 1983 if the cash award was $------?"

Strict procedures were followed by interviewers in increasing or decreasing bid amounts. The procedures are outlined in "Instructions to Interviewers" found in Appendix A. Two different bid ranges were used. The selected ranges depended on whether the question was aimed at measuring annual consumer surplus or consumer surplus per trip. For questions aimed at valuing a fishing trip, buds were limited to be between $1 and $800. In the two questions concerned with valuing a fishing season, bids were constrained to range between $1 and $8000.

Due to interview time constraints, only six bid interactions were used. That is to say that the maximum possible bids given to respondents to consider was six. A constraint on number of interactions shortened what could otherwise be a lengthy interview process, especially considering the lack of a priority knowledge about expected final bid amounts. Even with this procedural constraint, the bidding structure developed for interviewers allowed for only a 10 percent valuation error by the time the final bidding iteration was reached.

To test the effect of using different initial bid values, each subsample was divided into two respondent groups of 25 anglers. Each group received different initial bids. Members of

subsample I received initial bids of either $1 or $800. Members of subsample II received initial bids of $1 or $8000.

Angler responses to the four bidding game question are given in Tables 48 to 51. The bidding game question relating to anglers' willingness to pay the special fuel tax yielded a mean value of $41, based on usable responses of 38 anglers. Twenty-four percent of the survey group either refused to answer the question or indicated they did not know a proper answer. Although the bidding range did not include zero as a bid amount, six percent of the group insisted on reporting a $0 final bid.

Higher mean bids were observed in the question concerned with compensation for a day of fishing (Table 49). Here, the mean bid was $422, based on 30 usable responses. Once again, six percent of the group insisted on reporting a zero bid.

The mean bid for the game aimed at measuring anglers' willingness to pay an annual user fee was $400. However, 46 percent of respondents refused to answer this question. In the case of the award for foregoing fishing for a year, the mean bid was $6,039 with 32 percent of the group not responding.

Upon initial inspection of the survey data, it appeared that the mean values of bidding outcomes with lower starting values ($1 in all instances) were appreciably less than mean values of bidding outcomes when higher starting values ($800 or $8000) were used. For example, in the question concerning anglers' willingness to pay an annual user fee, respondents who started the bidding process at $8000 had a mean bid of $1,428. Given the magnitude of this dissimilarity, among others, statistical test of differences between means were conducted. Results of statistical tests concerning differences between mean bid outcomes are given in Appendix D. The power of these tests is small, however, due to small sample sizes. In all questions except one, the hypothesis could not be rejected at the 95 percent confidence level that the mean bids were the same for both initial starting values. The exception was the bidding question on anglers' willingness to accept compensation to forego a day of fishing. In this instance, anglers who were initially offered $800 to forego fishing had mean final bids of $667 while anglers who were offered only $1 in the initial bidding round had mean final bids of $189.15. These statistical tests support similar tests reported elsewhere by Thayer indicating that starting-point bias is not particularly evident in hypothetical valuation bidding games.

As in the case of open-ended question responses, mean consumer surplus estimates obtained through a bidding game process were consistent in the sense that estimates of trip consumer surplus were less than estimates of annual consumer

surplus. As would be expected based on economic theory, willingness to pay estimates were less than estimates of willingness to accept compensation.

Comparison between trip and annual valuation estimates are difficult to make based on bidding game results. Due to lack of prior information on expected bid outcomes, many final bids were equal to the highest allowable values ($800 or $8000) used in the bidding game. Care should be exercised in developing future bidding games so that top and bottom bid limits can accommodate all final bid outcomes.

Take-It-Or-Leave-It Questions

Take-it-or-leave-it question formats involved asking survey respondents to accept or reject a specified dollar offer. The respondent is only required to answer "yes" or "no" when presented with a hypothetical offer situation. It has been argued elsewhere by Samples, and Bishop and Heberlein, that this interview approach more closely resembled a typical market situation. Normally, American consumers, including Hawaii offshore fishermen, are confronted with market situations where prices of goods and services are fixed. The decision facing the consumer is whether to purchase or not; whether to take-it-or-leave-it.

Four different take-it-or-leave-it question formats were experimented with in the Pokai Bay survey. Two questions were designed to solicit information about anglers' valuation of a fishing day. Both of these questions were asked to members of subsample I. The first question inquired about anglers' willingness to pay a daily launch fee:

> "Suppose that the day before a fishing trip, you hear that a new law requires you to pay a launch fee everytime you take your boat out fishing. If the charge was set at (FIXED DOLLAR AMOUNT INSERTED HERE) per launch, would you pay the fee and go fishing as you had planned?"

A second question was designed to measure anglers' willingness to accept compensation to forego a day of fishing:

> "Suppose that the day before you planned to go on an offshore sportfishing trip, you got a call from a person who offered you cash if you agreed not to go fishing. If he offered to pay you (FIXED DOLLAR AMOUNT INSERTED HERE), would you agree not to go offshore sportfishing the following day?"

Fixed dollar amounts were randomly assigned to each respondent. Five different amounts were used: $1, $25, $150, and $450. Each value was used in 10 separate interviews. It was then recorded

whether the respondent accepted, or did not accept the offer.

The second two take-it-or-leave-it questions solicited information for valuing anglers' annual consumer surplus received from offshore sportfishing. The first of these measured willingness to accept compensation not to fish for a year:

> "Suppose someone offered you money if you agreed not to fish offshore at all during the rest of 1983. You would sign a legal contract that would stop you from going offshore fishing during 1983, although you could fish from shore or do other sport activities. If the money offered was (FIXED DOLLAR AMOUNT INSERTED HERE), would you agree to the deal and sign the contract?"

The last question asked fishermen's willingness to pay a certain fee for a fishing license:

> "Supppose a new law required offshore sport fishermen to purchase a fishing license. It would allow you to fish whenever you wished to in 1983. Without a license, you could not fish offshore at all. You would, however, be able to fish from the shore or do other sport activities. If the annual fee was set at (FIXED DOLLAR AMOUNT INSERTED HERE), would you purchase the license to be able to fish offshore during 1983?"

Again, different fixed dollar amounts were randomly assigned to respondents. Since these questions dealt with annual consumer surplus, five larger dollar amounts were used: $1, $250, $850, $1,500, and $4,500. Each value was used in 10 interviews. Respondents' acceptance or rejection of the offers was recorded.

Anglers' responses to the take-it-or-leave-it questions are summarized in Tables 52 to 55. The tables show the number of anglers either accepting or rejecting various dollar offer amounts. Two features of the results deserve special mention. First, compared with other question formats, relatively few anglers refused to answer the questions or reported that they did not know a proper answer. Out of a total of 200 separate occasions that take-it-or-leave-it questions were posed, only three (1.5 percent) anglers provided unusable answers. Secondly, it is encouraging that the pattern of responses corresponds closely with the response pattern hypothesized. Presumably, proportionally more anglers would accept higher compensatory payments than lower payments. Conversely, proportionally more anglers would accept lower imposed fees or costs than higher fees or costs. Such a pattern is evident in responses to all four logit questions.

Yes-no responses to take-it-or-leave-it offers are difficult

to interpret directly. A logit model provides a useful tool for dealing with such binary data (Samples). This experimental survey was not designed to provide the necessary data needed to estimate anglers' consumer surplus within the context of a logit framework. For this reason, no mean values can be calculated. Nevertheless, the survey provides clear indication that data needed for logit estimation could be supplied through take-it-or-leave-it type questions.

OFFSHORE RECREATIONAL FISHING ECONOMIC IMPACT MEASUREMENT

Alternative Economic Impact Measures

In order to discuss economic impacts, one must first begin with the concept of an economy as a system of producing and distributing wealth. For purposes of assessing the economic impact of offshore recreational fishing, it is useful to follow this "system" approach and consider an economy to be composed of two entities, recreational fishing households and business firms (industries). A simplified model of such a system would have households supplying inputs to firms in the form of labor, and at the same time demanding goods and services produced by the firms. Conversely, firms demand labor, while supplying goods and services. Thus, there arises a pattern of economic activity between fishermen and other sectors of Hawaii's island community.

Any change in angler expenditures affects the pattern of economic activity, and in turn may have economic welfare implications. It is desirable to be able to determine the effects that expected or proposed changes in angler spending behavior have on various industries or on households. Estimating these effects is commonly referred to as an economic impact analysis.

Economic impact analysis requires the construction of an Input-Output (I-O) model. An I-O model is a static representation of an economic region (for example the State of Hawaii) at equilibrium. It depicts endogenous production and processing industries, as well as exogenous sectors that create final demands. Three basic components of an I-O model are: 1) transaction or interindustry table, 2) technical coefficient table, and 3) interdependence table. These tables incapsulate the interdependencies between industries within an economy and are the very essence of economic impact analysis. Construction of I/O tables is based on three assumptions:

1) There is only one method used in producing each group of commodities and each sector has one homogeneous output.

2) Production relationships are linear in inputs and exhibit constant returns to scale over the relevant range of outputs for each sector.

3) There exists no external economies or diseconomies.

There are a number of alternative measures of economic impacts. The three typically discussed relate to impacts in terms of: (1) level of output (sales), (2) level of employment, and (3) level of income. Each of these economic impacts are generally further measured in terms of Type I and Type II multipliers.

In the case of measuring output or sales impacts, multiplier effects occur because of the high interdependence between industries and households in an economy. Households (offshore boat owners) purchase supplies and services which are required to produce an output (offshore recreational fishing days). At the same time, households supply labor which businesses require for their own productive activities. A plethora of transactions give rise to the simple (Type I) output multiplier. If, for example, there was a one percent increase in the number of offshore recreational fishing trips taken in a given year, fishermen might increase their purchases from the retail sector by say $200 and from the manufacturing sector by $300 in order to be able to engage in extra trips. If the retail sector has to in turn increase its purchases from the manufacturing sector by $250 in order to meet the new demand indirectly placed on it due to the one percent increase in offshore recreational fishing trips, a multiple sales effect results. Thus, an increase in sportfishermen's expenditures by $1 may give rise to a $1.62 increase in sales throughout Hawaii's economy. Multipliers can be viewed in two ways. On the one hand, they measure the increased (multiplied) sales that would be generated within the whole economy due to an increase in demand for offshore recreational fishing. Alternatively, they represent the multiplied loss of sales that would be incurred due to a decrease in the demand for offshore recreational fishing.

Simple (Type I) output multipliers are calculated with households considered as exogenous sectors. Simple multipliers do not take into account the added sales stemming from additional expenditures by labor which is employed to meet recreational fishermen's demands. When households are considered as endogenous to the system, a larger multiplier called a total or Type II multiplier is derived. In addition to measuring the direct and indirect effects, the Type II accounts for induced economic effects. Induced effects arise because industries also require additional labor to meet an increase in final demand. Accompanying any increased labor purchases is additional economic activity as wages are respent on goods and services. Type II multipliers will always be larger than corresponding Type I multipliers.

Employment is another economic impact which should be studied. Generally speaking, the total employment multiplier is

multipliers arise due to the labor demands created as a result of anglers expenditures in certain sectors, which in turn create labor demands in interdependent sectors. The mechanics of calculating this multiplier are similar to output multiplier calculations.

In addition to changes in output and employment, there may be interest in changes in household income that would result from changes in demand for charter vessel services. Total changes in income, like output, can be calculated in two ways. The first method takes into account both the direct and indirect effects. The multiplier estimated is called the Type I income multiplier (the analog of the simple output multiplier). Type II income multipliers are more realistic because they account for the induced changes in income resulting from increased consumer spending (Miernyk, 1965).

Computation of the Type I income multiplier requires data of direct, as well as direct-plus-indirect income changes. A direct income change is that portion of income that goes directly to households as wages, salaries, and dividends due to an increase in output of a particular industrial sector. The Type II income multiplier is simply the Type I multiplier plus the induced effect created by treating the household sector as endogenous.

Appraisal of Existing Multipliers

A variety of existing published multipliers are available which could conceivably be used to assess the direct and indirect socioeconomic impacts of offshore sportfishing in Hawaii. These include: (1) Hoffman and Yamauchi's estimated multiplier, (2) multipliers estimated for other localities in the United States but relating to sportfishing, (3) regional multipliers estimated by the Bureau of Economic Analysis, (4) multipliers estimated using the National I-O model, and (5) multipliers derived from Hawaii's I-O model.

The economic impact of recreational fishing in Hawaii, both onshore and offshore, was studied by Hoffman and Yamauchi in 1968. Economic impacts were evaluated in terms of an income expansion multiplier. The procedure involved using published data to construct a fishing expenditure function which took the effect of imports into consideration. A modified Keynesian Income Multiplier (modified because it corrected for input leakages) was calculated from published data. Specifically, the income multiplier used by Hoffman and Yamauchi was expressed as follows:

$$\text{Total income increase} = A/(1-EC)$$

where A = initial expenditures remaining in local area

B = marginal propensity to spend disposable income locally

C = proportion of expenditures of local people that accrues as local income.

The term 1/(1-B) is the familiar Keynesian multiplier, and the parameters A and C are included to adjust for leakages. Calculation of the income multiplier depends upon the values of parameters B and C. The value of B, which is based on data from an empirical study published in 1971, was calculated at 0.77 (Ghali and Renaud, 1971). The value of C, 0.5, was obtained from a 1960 study entitled The Impact of Exports on Income in Hawaii (FHB, 1960). Thus an income multiplier of $1/\langle 1 - (07.77)\ (0.5)\rangle$ = 1.63 was calculated.

Total increase in income due to recreational fishing expenditures was calculated as A X 1.63. The functional value of A was derived from the 1960 FHB study as:

$$A = .419t + .498v + .419f$$

where t = total transportation cost

v = total additional living costs

f = total cost for fishing equipment

Values for t, v, and f were obtained by means of a mail survey. Substituting the estimated values into the formula for A yielded a total economic impact of $11.5 million.

Several difficulties exist in directly utilizing the Hoffman and Yamauchi income expansion multiplier. First, the current relevancy of estimates over 10 years old is highly questionnable given the degree to which basic structural changes have occurred in Hawaii's economy. Furthermore, it is advisable to examine output and employment multipliers, topics not covered in the recreational fishing study. Another factor is that the Hoffman and Yamauchi study expressed the income multiplier as a function only of expenditures of fishermen. While this relationship is clearly fundamental, consideration must also be given to the fact that recreational fishing vessels supply intermediate goods to the

economy in the form of fish landings. Hoffman and Yamauchi did not consider this relationship.

A large number of recreational fishing economic impact studies have been conducted using regional or local I-O models (see for example Crompton and Ditton, Mathews and Brown, Schmisser and Youmans). Typical of these is a study by Rieling, Cook and Taylor which was concerned with recreational ice fishing in Maine. The investigators first determined the total expenditures of ice fishermen in Maine using a questionnaire survey. These expenditures were allocated to the three sectors--wholesale and retail trade, transportation, and services. Output multipliers for each of these sectors were obtained from the Regional Economic Analysis Division, U.S. Department of Commerce. Direct impact was reported as the actual expenditures spent in the three sectors. Indirect impact was calculated as being the direct impact multiplied by the corresponding adjusted sector specific gross output multipliers minus one. A total impact of $20 million was reported as the sum of the direct and indirect impacts. Analysis of economic impacts in terms of employment and income was not reported.

From a purely pragmatic standpoint, it is possible to adopt one or more of these published multipliers and apply them in the context of Hawaii's offshore recreational fishery. While this may have the advantage of simplicity, three serious drawbacks can be identified. First, by nature of Hawaii's geographic circumstances, its economy is in many respects structurally different from local economies on the U.S. mainland, particularly in respect to the leakage effects of imports. Secondly, it is often difficult to ascertain how many multipliers developed elsewhere were actually derived and whether they represent Type I or Type II varieties. Third, more often than not, only sales multipliers are reported and employment and income impacts are not investigated.

These shortcomings could be largely overcome by directly obtaining multipliers estimated by the Bureau of Economic Activity (BEA), U.S. Department of Commerce. The BEA has estimated output multipliers for 173 regions within the United States, Hawaii being one of those regions. Output multipliers for 56 industrial sectors within a region were estimated via the Regional Industrial Multiplier System (RIMS) developed by the BEA. Ordinarily, regional impact analysis requires the construction of an entire I-O model for the region under study. The RIMS procedure is an effort to provide some of the analytic opportunities of the I-O framework without incurring the costs of creating an entire I-O

model for a region. (Regional Economic Analysis Division). The procedure relies on the National I-O model, as well as region specific data to generate its multipliers.

A researcher interested in sales impacts of offshore recreational fishing can be reasonably assured that the BEA multiplier estimates are current and reasonably accurate. A problem, however, is that BEA estimates only output multiplier and hence employment and income impacts cannot be measured. Furthermore, while BEA multipliers are broken down by sectors, the sectors are quite aggregated and may reduce the precision to which economic impacts can be evaluated.

A fourth alternative is to rely on estimates of sales, income, and employment multipliers estimated from the National I-O model. These multipliers are published by the U.S. Department of Commerce and have been used in a variety of recreational fishing studies. Notable among such studies is one conducted in 1977 by Centaur Management Consultants, Inc. Two potential difficulties exist in using National multiplier estimates: (1) the problem of datedness of the structural parameters underlying the National I-O model, and (2) the differences between Hawaii's economy and the U.S. as a whole.

A Suggested Approach

The Department of Planning and Economic Development (DPED), State of Hawaii, has an interindustry I-O model of the State's economy. The model has been derived from National I-O studies and surveys of Hawaii's firms conducted by the DPED and the University of Hawaii. The economy of the State has been disaggregated into 57 industries each of which is represented in the interindustry transaction matrix of the model. Since offshore recreational fishing is a relatively insignificant economic activity, it is not represented as a separate sector in the model. Consequently, it is not possible to obtain multipliers for offshore sport fishing activities directly from the State I-O model.

Establishing recreational fishing as a separate sector in the I-O model requires data specifying the amount of recreational fishing expenditures directed at each industry in the model. Responses to a questionnaire could provide data on how much the recreational fishermen purchase from specific industries in the I-O model. However, particular care has to be given in constructing the questionnaire to explicitly estimate the amount of direct purchases made by recreational vessel owners from sources outside of Hawaii (vessels, gear, supplies). That is, the effect of import leakages must be accounted for. Integration of

recreational fishing purchases as a separate industry into the I-O model is necessary in order for it to be represented properly.

Once the data on offshore recreational fishermen's purchases and sales have been collected, it becomes a matter of integrating this into the I-O model by rebalancing the existing elements of the matrix. It then becomes possible to derive the various multipliers by performing the necessary manipulations and matrix algebra. Simple and total multipliers for output, income, and employment will be calculated. All necessary manipulations can be accomplished by accessing the State I-O model using the State Database System. Access to the State Database System can be accomplished using the University of Hawaii TSO System (IBM 370). The State I-O model can be copied to any authorized user's files. Documentation for using the I-O program, as well as programming assistance, can be obtained from the Reseach and Economic Analysis Division, State of Hawaii Department of Planning and Economic Development. Several aproaches to using the model for recreational fishing economic impact analysis can be followed. One way is to create a new production sector called recreational fishing. Expenditures made by fishermen must be allocated to various sectors: boat, repair, rental, gasoline service stations, etc. Sales of fish can be allocated to the wholesale food sector. Special adjustments for impact packages probably do not have to be made because the model is already pre-adjusted to reflect impact demands by various sectors. Resulting output multiplier estimates will be compared with published regional economic impact assessment multipliers.

PROCEDURAL RECOMMENDATIONS

The purpose of this section is to report possible suggestions in refining the instrument and to recommend possible solutions in the logistical implications for future studies. The suggestions and recommendations are based on reports and experience from the field workers and staff of SMS Research and also our prior knowledge in conducting fisheries research for NMFS.

Instrument

In a pilot study, the testing of the instrument for its effectiveness and appropriateness is probably the most integral part of the study. Even though the instruments were revised, refined, and pretested, there are some suggestions we can make to improve upon the instrument.

Interview Length

Administration of the interview ranged between 12 and 27 minutes. The average interview took approximately 18 minutes to to conduct. We feel this average is appropriate and does not isolate fishermen longer than necessary. An interview that lasts lasts over 20 minutes will incur more mid-interview terminations and refusals.

Resistance

Wording

The question to qualify fishermen as "recreational" elicited some form of resistance among respondents to define their purpose. Some respondents were afraid to say, "No, I'm a commercial fisherman," because of the peculiarities of tax and legal implications of the commercial or semi-commercial fishing industry.

Perhaps some rewording or classification should be made at the start of the survey.

Both sets of questions dealing with valuation elicited resistance among fishermen. Many could not perceive the situational aspects of the question as "real" and the interviewer may have had to repeat the question. About half the respondents may not have taken it seriously enough to give serious answers while others responded with comments such as:

"I won't take anything to stop fishing."

"Its unfair to charge anything, this is Hawaiian Waters."

"This is not a 'money' or 'dollar' issue."

Perhaps some change in the wording to provide more realistic situations or examples would improve the responses.

The valuation question that was received most consistently was Q.22 (Subsample I) which referred to "Top Secret Navy Operations." In some cases, respondents were extremely moved towards nonacceptance of money because of those words. It seemed to be almost a matter of civil duty to cooperate with their country.

In the valuation questions, when respondents were asked to give an unaided dollar figure, the respondent would usually interrupt them with responses such as "No, I won't take anything." Interviewers then experimented with arbitrary dollar figures which were received better.

These questions would seem to report inaccurate findings and perhaps changes in format towards aided responses may prove more successful.

In the majority of cases, each valuation question had to be repeated at least once. In some instances, interviewers had to interpret the question to the understanding of the respondents. The problem was caused by the hypothetical nature of the question because to most fishermen it was perceived as beyond the realm of possibility.

The wording of all other questions seemed appropriate and seemed to provide accurate data.

Sample

Weekday/Weekend

The majority of recreational fishermen can be found during weekend days. Although SMS established quotas for weekday and weekend interviews, more fishermen were fishing on weekends. On the other hand, a higher percentage of commercial fishermen could be found on weekdays.

It is suggested that a proportionate sample be used in future studies to account for the majority of weekend recreational fishermen.

Time of Day

SMS interviewers were instructed to work between 9:00 a.m. and 7:00 p.m. In all cases, interviewers reported that very few fishermen were found to come back before 12:00 p.m. The peak period seemed to be between 1:00 p.m. and 3:00 p.m. on both weekdays and weekends.

It is suggesetd that in future studies, the sample should be designed to proportionately accommodate the afternoon arrivals. However, the morning hours should still be kept to field information from "bottom fishermen."

Data Collection

Interviewers

SMS Research used interviewers who were trained and experienced in intercept interviewing techniques. In addition, some of the interviewers had worked on the recently completed SURVEY OF THE BROKER AND RETAIL SECTORS and SURVEY OF FISH WHOLESALERS, giving them working knowledge of fish species and fisheries surveys. The interviewers were received well by the "local" fishermen operating out of the Waianae area. This may or may not hold true in other launch areas, however the "local" image and background seemed essential towards soliciting the cooperation from these fishermen.

It is suggested in future studies that interviewers selected to conduct surveys with fishermen be matched with the general identities, and the ethnic and geographical balance from each launch locale.

Fielding Materials

Interviewers who worked on this pilot study were equipped with letters of cooperation from NMFS and showcards developed by SMS to aid the data collection activities. The letters proved extremely helpful, however the showcards did not serve to aid in the administration of the interview very much. There were too many showcards developed and the added bulk of materials to carry did not expedite the interviewing process. Also, most fishermen interviewed in the wash areas of the parking lot usually displayed "wet hands." This situation was not conducive to handling documents of any kind and interviewers found it better to read the question and answer categories in precise and deliberate manner.

It is suggested in future studies that interviewers be issued a letter of cooperation from NMFS and not be equipped with

too many showcards or other materials because of the nature of the interview site. Letters sent to notable and influential leaders in the fishing community would also help in many aspects of the study. It would first aid in attaining the cooperation of fishermen in each community and secondly keep the leaders informed of the activities and services of NMFS in the local fishing industry.

One note that should be made was the comment from many fishermen that were interviewed, "Bring the buoys back!" These comments were made after fishermen were made aware of the fact that the survey was being done for NMFS.

Valuation Alternatives

The pilot recreational valuation survey provides indication that sportfishermen in Hawaii place a high value on the opportunity to fish offshore. Evidence such as substantial annual fishing related expenditures, high participation rates, few identified substitutes, and strong reported attachment to their sport, lead one to believe that anglers' consumer surplus is large. It may approach current expenditure levels.

Research findings reported above shed light on how offshore fishing valuation should be approached. To begin with, the findings suggest that use of two or more techniques is advisable. Simultaneous use of different valuation methods allows for internal validation of resulting value estimates. This is relevant consideration given the difficulty invalidating measures of otherwise unobservable phenomena. It is also advisable to employ a combination of willingness to pay and willingness to accept compensation measures. This allows for upper and lower bounds of true consumer surplus values to be obtained.

The choice of which estimation method to employ is a crucial question. Survey data indicate that demand estimation problems may arise if the travel cost method is applied using a single site model specification. A multiple site model that treats launch sites as imperfect substitutes would seemingly be a preferred alternative. Development of such a model would require launch sites to be somehow characterized in terms of quality attributes. Site classification could then be verified using questionnaire data on anglers' site selection behavior.

In using the travel cost method, costs (fuel and time) to reach the desired fishing site by boat should be included in travel cost calculations.

Due to the low proportion of travel costs to total fishing costs, estimates of angler consumer surplus gleaned from a travel cost model should probably be viewed as lower bound estimates of

anglers' true valuation. Hypothetical valuation techniques can provide upper-bound estimates, particularly if angler willingness to accept compensation is measured.

Experimental survey findings indicate that careful consideration should be given to selecting hypothetical valuation scenarios that are realistic, and at the same time not provocative. Hypothetical situations that revolve around vague user fees, and new taxes appear to generate higher than normal refusal rates. Consequently, valuation estimates could be biased, but the direction of the bias is difficult to measure.

Survey findings indicate that questions that solicit respondents' opinions on "fair" prices for launch fees and fishing licenses yield downward biased value estimates. Value estimates derived from such questions should be considered minimum estimates of true angler consumer surplus.

Questions which ask fishermen their willingness to pay launch fees look promising in terms of relatively low refusal rates. However, launch charges are not a relevant cost factor for fishermen with permanently moored boats.

Of the three hypothetical valuation techniques tested, the take-it-or-leave-it offers received the lowest refusal rate. Use of this question approach, perhaps within the hypothetical contexts of anglers facing a new license fee charge and anglers accepting cash payments not to fish for a day, could yield useful value estimates.

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APPENDICES

APPENDIX A

TABULATED SURVEY DATA

TABLE 1

INDIVIDUALS INTERVIEWED: SUB-SAMPLE I
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

STATUS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
OWNER	39	39	78.000	78.000
SKIPPER	11	50	22.000	100.000

TABLE 2

INDIVIDUALS INTERVIEWED: SUB-SAMPLE II
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

STATUS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
OWNER	44	44	88.000	88.000
SKIPPER	6	50	12.000	100.000

TABLE 3

SEX OF RESPONDENTS: SUB-SAMPLE I
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

SEX	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
MALE	49	49	98.000	98.000
FEMALE	1	50	2.000	100.000

TABLE 4

SEX OF RESPONDENTS: SUB-SAMPLE II
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

SEX	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
MALE	50	50	100.000	100.000

TABLE 5

AGE OF RESPONDENTS: SUB-SAMPLE I
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

AGE IN YEARS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
18 TO 24	4	4	8.000	8.000
25 TO 34	14	18	28.000	36.000
35 TO 44	20	38	40.000	76.000
45 TO 54	8	46	16.000	92.000
55 TO 64	3	49	6.000	98.000
65 OR OVER	1	50	2.000	100.000

TABLE 6

AGE OF RESPONDENTS: SUB-SAMPLE II
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

AGE IN YEARS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
18 TO 24	1	1	2.000	2.000
25 TO 34	14	15	28.000	30.000
35 TO 44	22	37	44.000	74.000
45 TO 54	9	46	18.000	92.000
55 TO 64	3	49	6.000	98.000
65 OR OVER	1	50	2.000	100.000

TABLE 7

EMPLOYMENT STATUS OF RESPONDENTS: SUB-SAMPLE I
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

EMPLOYED?	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
YES	40	40	80.000	80.000
NO	10	50	20.000	100.000

TABLE 8

EMPLOYMENT STATUS RESPONDENTS: SUB-SAMPLE II
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

EMPLOYED?	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
YES	44	44	88.000	88.000
NO	6	50	12.000	100.000

TABLE 9

OCCUPATION OF EMPLOYED RESPONDENTS: SUB-SAMPLE I
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

OCCUPATION	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
PROFESSIONAL	6	6	15.000	15.000
CLERICAL	3	9	7.500	22.500
SERVICE	8	17	20.000	42.500
FARM FISH	1	18	2.500	45.000
MACHINE	4	22	10.000	55.000
BENCH WORK	2	24	5.000	60.000
STRUCTURAL WORK	12	36	30.000	90.000
MISCELLANEOUS	4	40	10.000	100.000

TABLE 10

OCCUPATION OF EMPLOYED RESPONDENTS: SUB-SAMPLE II
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

OCCUPATION	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
PROFESSIONAL	11	11	25.000	25.000
CLERICAL	1	12	2.273	27.273
SERVICE	8	20	18.182	45.455
FARM FISH	1	21	2.273	47.727
PROCESSING	1	22	2.273	50.000
MACHINE	5	27	11.364	61.364
STRUCTURAL	13	40	29.545	90.909
MISCELLANEOUS	4	44	9.091	100.000

TABLE 11

ANNUAL INCOME OF RESPONDENTS: SUB-SAMPLE I
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

INCOME LEVEL	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
5001 TO 10000	2	2	4.000	4.000
10001 TO 15000	1	3	2.000	6.000
15001 TO 20000	7	10	14.000	20.000
20001 TO 30000	17	27	34.000	54.000
30001 TO 40000	12	39	24.000	78.000
MORE THAN 40000	3	42	6.000	84.000
REFUSED	8	50	16.000	100.000

TABLE 12

ANNUAL INCOME OF RESPONDENTS: SUB-SAMPLE II
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

INCOME LEVEL	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
5000 OR LESS	2	2	4.000	4.000
5001 TO 10000	1	3	2.000	6.000
10001 TO 15000	3	6	6.000	12.000
15001 TO 20000	5	11	10.000	22.000
20000 TO 30000	19	30	38.000	60.000
30001 TO 40000	9	39	18.000	78.000
MORE THAN 40000	1	40	2.000	80.000
REFUSED	10	50	20.000	100.000

TABLE 13

NUMBER OF RESPONDENTS WITH COMMERCIAL FISHING LICENSES
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

LICENSED?	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
YES	20	20	40.000	40.000
NO	30	50	60.000	100.000

TABLE 14

NUMBER OF RESPONDENTS WITH COMMERCIAL LICENSES
WHO SOLD FISH LAST YEAR
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

SOLD FISH?	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
YES	11	11	55.000	55.000
NO	9	20	45.000	100.000

TABLE 15

STATUS OF VESSEL OWNERSHIP BY RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

OWNED?	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
YES	46	46	92.000	92.000
NO	4	50	8.000	100.000

TABLE 16

NUMBER OF YEARS THAT VESSEL OWNED BY RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

YEARS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0 TO 2	26	26	52.000	52.000
3 TO 5	21	47	42.000	94.000
6 TO 8	1	48	2.000	96.000
9 TO 11	1	49	2.000	98.000
12 AND OVER	1	50	2.000	100.000

TABLE 17

LENGTH OF VESSEL USED BY RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

LENGTH IN FEET	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
10 TO 15	4	4	8.000	8.000
16 TO 20	28	32	56.000	64.000
21 TO 25	17	49	34.000	98.000
26 TO 30	1	50	2.000	100.000

TABLE 18

INITIAL COST OF VESSEL FOR RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

COST IN DOLLARS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
UNDER 1000	3	3	6.000	6.000
1000 TO 5000	17	20	34.000	40.000
5000 TO 10000	14	34	28.000	68.000
10000 TO 20000	12	46	24.000	92.000
20000 TO 30000	3	49	6.000	98.000
DON'T KNOW	1	50	2.000	100.000

TABLE 19

ESTIMATED FUEL USE (GALLONS PER HOUR)
FOR RESPONDENTS' VESSELS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

FUEL USE RATE	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1 TO 2	19	19	38.000	38.000
3 TO 4	27	46	54.000	92.000
5 TO 6	2	48	4.000	96.000
DON'T KNOW	2	50	4.000	100.000

TABLE 20

NUMBER OF BOATING TRIPS TAKEN BY RESPONDENTS DURING
LAST 12 MONTHS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

NUMBER	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1 TO 10	12	12	24.000	24.000
11 TO 20	5	17	10.000	34.000
21 TO 30	6	23	12.000	46.000
31 TO 40	5	28	10.000	56.000
41 TO 50	7	35	14.000	70.000
51 TO 75	6	41	12.000	82.000
76 TO 100	3	44	6.000	88.000
101 TO 150	5	49	10.000	98.000
150 AND OVER	1	50	2.000	100.000

TABLE 21

PERCENTAGE OF BOATING TRIPS TAKEN BY RESPONDENTS
THAT WERE PRIMARILY FOR PURPOSES OF FISHING
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

PERCENT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	2	2	4.000	4.000
41 TO 50	1	3	2.000	6.000
51 TO 75	1	4	2.000	8.000
76 TO 100	46	50	92.000	100.000

TABLE 22

NUMBER OF RESPONDENTS USING VESSEL FOR ACTIVITIES
OTHER THAN OFFSHORE RECREATIONAL FISHING ON CURRENT TRIP
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

OTHER USES?	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
YES	2	2	4.000	4.000
NO	48	50	96.000	100.000

TABLE 23

SCOPE OF VESSEL USES OTHER THAN OFFSHORE RECREATIONAL REPORTED BY RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

ACTIVITIES	FREQUENCY	PERCENT
DIVING	1	2.000
PLEASURE	1	2.000
NONE	48	96.000

TABLE 24

TYPES OF FISHING-RELATED RECORDS MAINTAINED BY RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

RECORD TYPE	FREQUENCY	PERCENT
NUMBER OF TRIPS	18	36.000
NUMBER OF PEOPLE ABOARD	11	22.000
HOURS AT SEA	14	28.000
ENGINE RUNNING TIME	20	40.000
NUMBER OF FISH CAUGHT	20	40.000
TYPE OF FISH CAUGHT	18	36.000
FISHING RELATED COSTS	23	46.000

TABLE 25

ANNUAL FISH CATCH REPORTEDLY MADE BY RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

FISH TYPE	PERCENT OF ANGLERS REPORTING CATCH	AVERAGE NUMBER CAUGHT	AVERAGE PERCENT CAUGHT NEAR FADS	AVERAGE PERCENT SOLD
ONO	22	8	9	38
MAHI	26	19	20	27
STRIPED MARLIN	12	4	46	13
SHARK	7	1	83	0
AHI	10	7	49	22
BLUE MARLIN	7	4	58	34
SPEARFISH	6	12	42	35
BOTTOMFISH	7	142	14	49
AKU	12	83	33	0
BLACK MARLIN	2	2	50	0

TABLE 26

CHANGES IN AMOUNT OF TIME SPENT SPORT FISHING SINCE
RESPONDENTS FIRST BEGAN OFFSHORE FISHING IN HAWAII
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

CHANGE IN FISHING TIME	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
INCREASED	14	14	28.000	28.000
DECREASED	15	29	30.000	58.000
STAYED THE SAME	21	50	42.000	100.000

TABLE 27

DEGREE TO WHICH RESPONDENTS WOULD MISS
OFFSHORE SPORT FISHING IF NO LONGER AVAILABLE
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DEGREE	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
A LOT	40	40	80.000	80.000
SOMEWHAT	4	44	8.000	88.000
ONLY A LITTLE	5	49	10.000	98.000
DON'T KNOW	1	50	2.000	100.000

TABLE 28

ACTIVITIES WHICH RESPONDENTS WOULD SUBSTITUTE
FOR OFFSHORE SPORT FISHING IF NO LONGER AVAILABLE
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

SUBSTITUTE ACTIVITY	FREQUENCY	PERCENT
SHORE FISHING	24	48.000
DIVING	20	40.000
HUNTING	14	28.000
THROW NETTING	7	14.000
GOLF	6	12.000
HOUSEHOLD WORK	3	6.000
OTHER SPORTS	17	34.000
OTHER ACTIVITIES	7	14.000

TABLE 29

REPORTED CHANGE IN RESPONDENTS' SATISFACTION IF CROWDING AT LAUNCH SITES AND FISHING AREAS REDUCED
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

CHANGE IN SATISFACTION	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
A LOT	29	29	58.000	58.000
SOMEWHAT	7	36	14.000	72.000
ONLY A LITTLE	4	40	8.000	80.000
NO DIFFERENCE	10	50	20.000	100.000

TABLE 30

MAXIMUM NUMBER OF ADDITIONAL MILES RESPONDENTS WILLING TO TRAVEL TO REACH UNCROWDED FISHING LOCATION
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

MILES	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0 TO 5	21	21	42.000	42.000
6 TO 10	7	28	14.000	56.000
11 TO 20	12	40	24.000	80.000
21 TO 30	4	44	8.000	88.000
51 TO 60	1	45	2.000	90.000
91 TO 100	1	46	2.000	92.000
DON'T KNOW	2	48	4.000	96.000
REFUSED	2	50	4.000	100.000

TABLE 31

REPORTED CHANGE IN NUMBER OF TRIPS TAKEN BY
RESPONDENTS DUE TO 50 PERCENT REDUCTION IN CATCH
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

CHANGE IN TRIPS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
MORE	8	8	16.000	16.000
FEWER	30	38	60.000	76.000
ABOUT THE SAME	12	50	24.000	100.000

TABLE 32

REPORTED PERCENTAGE CHANGE IN NUMBER OF TRIPS TAKEN BY
THOSE RESPONDENTS WHO WOULD ALTER TRIP FREQUENCY
DUE TO A 50 PERCENT REDUCTION IN CATCH
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

PERCENT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1 TO 10	3	3	7.895	7.895
11 TO 20	5	8	13.158	21.053
21 TO 30	12	20	31.579	52.632
31 TO 40	1	21	2.632	55.263
41 TO 50	14	35	36.842	92.105
71 TO 80	2	37	5.263	97.368
91 TO 100	1	38	2.632	100.000

TABLE 33

LAUNCH LOCATIONS USUALLY USED BY RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

LOCATION	FREQUENCY	PERCENT
POKAI BAY	50	100.000
KANEOHE	8	16.000
KEEHI	7	14.000
HAWAII KAI	3	6.000
HALEIWA	3	6.000
ALA WAI	1	2.000

TABLE 34

FACTORS WHICH RESPONDENTS REPORT AS BEING IMPORTANT AND
MOST IMPORTANT IN SELECTING A LAUNCH LOCATION
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

FACTOR	IMPORTANT FREQUENCY	IMPORTANT PERCENT	MOST IMPORTANT FREQUENCY	MOST IMPORTANT PERCENT
CLOSENESS TO HOME	32	64	9	18
CLOSENESS TO GOOD FISHING	43	86	24	48
SCENIC DRIVE	7	14	0	0
CLOSENESS TO FRIENDS & RELATIVES	16	32	0	0
GOOD LAUNCH FACILITIES	40	80	7	14
GOOD WEATHER	42	84	8	16
UNCROWDED LAUNCH	30	60	1	2
GOOD STORES NEARBY	19	38	1	2

TABLE 35

MILES TRAVELED BY RESPONDENTS TO
REACH POKAI BAY LAUNCH AREA FOR CURRENT TRIP
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

MILES	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1 TO 5	23	23	46.000	46.000
6 TO 10	2	25	4.000	50.000
11 TO 20	9	34	18.000	68.000
21 TO 30	7	41	14.000	82.000
31 TO 40	4	45	8.000	90.000
41 TO 50	3	48	6.000	96.000
51 TO 100	2	50	4.000	100.000

TABLE 36

TIME SPENT BY RESPONDENTS TO REACH
POKAI BAY LAUNCH AREA FOR CURRENT TRIP
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

TIME	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
LESS THAN 15 MIN	15	15	30.000	30.000
15 TO 30 MIN	13	28	26.000	56.000
31 TO 60 MIN	8	36	16.000	72.000
1 TO 2 HRS	14	50	28.000	100.000

TABLE 37

MILES TRAVELED BY RESPONDENTS IN BOAT
BEFORE ACTUALLY STARTING FISHING ON CURRENT TRIP
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

MILES	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	16	16	32.000	32.000
1 TO 5	26	42	52.000	84.000
6 TO 10	4	46	8.000	92.000
11 TO 15	3	49	6.000	98.000
26 TO 30	1	50	2.000	100.000

TABLE 38

INFLUENCE OF LAUNCH LOCATION ON DISTANCE
RESPONDENTS TRAVEL BEFORE ACTUALLY STARTING FISHING
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

INFLUENCE DISTANCE?	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
YES	38	38	76.000	76.000
NO	11	49	22.000	98.000
DON'T KNOW	1	50	2.000	100.000

TABLE 39

LENGTH OF TIME RESPONDENTS SPENT FISHING DURING CURRENT TRIP
ON CURRENT TRIP
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

HOURS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1 TO 3	3	3	6.000	6.000
4 TO 6	16	19	32.000	38.000
7 TO 9	27	46	54.000	92.000
10 TO 12	1	47	2.000	94.000
16 TO 19	2	49	4.000	98.000
20 TO 22	1	50	2.000	100.000

TABLE 40

FISHING COSTS INCURRED BY RESPONDENTS
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE= 50

COST ITEM	COST PER TRIP	COST PER YEAR
BAIT	-a-	$ 7
FOOD AND BEVERAGE	$12	544
ICE	4	182
FUEL AND OIL (FOR BOAT)	31	1,407
FUEL AND OIL (FOR TRUCK)	8	363
SAFETY AND ELECTRONICS	2	90
REPAIRS	12	558
TOURNAMENT FEES	1	65
INSURANCE	2	92
TACKLE	5	223
RODS AND REELS	12	562
DUES AND LICENSES	-a-	22
OTHER EQUIPMENT	3	135
BOAT PAYMENT	12	530
TOTAL	$104	$4,780

-a- LESS THAN $1

TABLE 41

NUMBER OF DAYS SPENT BY RESPONDENTS IN
WAIANAE AREA ON CURRENT TRIP
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 100

DAYS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	97	97	97.000	97.000
2	3	100	3.000	100.000

TABLE 42

NUMBER OF PERSONS SHARING EXPENSES WITH
RESPONDENTS FOR CURRENT TRIP
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

NUMBER	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	15	15	30.000	30.000
2	13	28	26.000	56.000
3	16	44	32.000	88.000
4	4	48	8.000	96.000
5	2	50	4.000	100.000

TABLE 43

AMOUNT OF ANNUAL PURCHASES MADE BY RESPONDENTS
DIRECTLY FROM SUPPLY SOURCES OUTSIDE OF HAWAII
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1 TO 10	44	44	88.000	88.000
21 TO 30	1	45	2.000	90.000
91 TO 100	1	46	2.000	92.000
MORE THAN 100	4	50	8.000	100.000

TABLE 44

FAIR PRICE REPORTED BY RESPONDENTS FOR DAILY LAUNCH FEE
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	14	14	28.000	28.000
1 TO 5	21	35	42.000	70.000
11 TO 20	2	37	4.000	74.000
41 TO 50	1	38	2.000	76.000
DON'T KNOW	11	49	22.000	98.000
REFUSED	1	50	2.000	100.000

TABLE 45

MINIMUM PAYMENT REQUESTED BY RESPONDENTS
TO AGREE TO NOT FISH FOR ONE DAY
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	4	4	8.000	8.000
21 TO 30	3	7	6.000	14.000
31 TO 50	5	12	10.000	24.000
76 TO 100	11	23	22.000	46.000
251 TO 500	2	25	4.000	50.000
751 TO 1000	5	30	10.000	60.000
1001 TO 2500	2	32	4.000	64.000
6001 TO 7500	1	33	2.000	66.000
DON'T KNOW	7	40	14.000	80.000
REFUSED	10	50	20.000	100.000

TABLE 46

FAIR PRICE REPORTED BY RESPONDENTS FOR ANNUAL FISHING LICENSE
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	7	7	14.000	14.000
1 TO 5	8	15	16.000	30.000
6 TO 10	8	23	16.000	46.000
11 TO 15	1	24	2.000	48.000
16 TO 20	2	26	4.000	52.000
21 TO 50	8	34	16.000	68.000
DON'T KNOW	7	41	14.000	82.000
REFUSED	9	50	18.000	100.000

TABLE 47

MINIMUM COMPENSATION REQUESTED BY
RESPONDENTS TO FORGO OFFSHORE FISHING FOR ONE YEAR
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	2	2	4.000	4.000
201 TO 500	1	3	2.000	6.000
501 TO 1000	1	4	2.000	8.000
1001 TO 2500	3	7	6.000	14.000
2501 TO 5000	3	10	6.000	20.000
7501 TO 10000	10	20	20.000	40.000
10001 TO 15000	3	23	6.000	46.000
15001 TO 40000	3	26	6.000	52.000
DON'T KNOW	14	40	28.000	80.000
REFUSED	10	50	20.000	100.000

TABLE 48

MAXIMUM PRICE RESPONDENTS WILLING TO PAY FOR
SPECIAL FUEL TAX THAT ALLOWS FOR ONE DAY OF FISHING
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	3	3	6.000	6.000
1 TO 5	16	19	32.000	38.000
21 TO 25	11	30	22.000	60.000
26 TO 50	4	34	8.000	68.000
51 TO 75	1	35	2.000	70.000
76 TO 100	2	37	4.000	74.000
800	1	38	2.000	76.000
DON'T KNOW	1	39	2.000	78.000
REFUSED	11	50	22.000	100.000

TABLE 49

MINIMUM COMPENSATION REQUESTED BY
RESPONDENTS TO FORGO OFFSHORE FISHING FOR ONE DAY
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	3	3	6.000	6.000
1	8	11	16.000	22.000
25	1	12	2.000	24.000
75	1	13	2.000	26.000
200	1	24	2.000	28.000
400	8	22	16.000	44.000
475	2	24	4.000	48.000
800	15	39	30.000	78.000
DON'T KNOW	1	40	2.000	80.000
REFUSED	10	50	20.000	100.000

TABLE 50

MAXIMUM BID AMOUNT REPORTED BY
RESPONDENTS FOR ANNUAL USER FEE
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	2	2	4.000	4.000
1	19	21	38.000	42.000
250	2	23	4.000	46.000
500	1	24	2.000	48.000
800	1	25	2.000	50.000
1000	1	26	2.000	52.000
8000	1	27	2.000	54.000
DON'T KNOW	4	31	8.000	62.000
REFUSED	19	50	38.000	100.000

TABLE 51

MINIMUM ACCEPTABLE CASH AWARD REPORTED BY
RESPONDENTS TO FORGO OFFSHORE FISHING FOR ONE YEAR
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

DOLLAR AMOUNT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	2	2	4.000	4.000
100	1	3	2.000	6.000
500	1	4	2.000	8.000
3750	1	5	2.000	10.000
4000	5	10	10.000	20.000
4750	1	11	2.000	22.000
6000	2	13	4.000	26.000
7000	3	16	6.000	32.000
7750	3	19	6.000	38.000
8000	15	34	30.000	68.000
DON'T KNOW	3	37	6.000	74.000
REFUSED	13	50	26.000	100.000

TABLE 52

ACCEPTANCE OR REJECTION OF OFFER TO PAY DAILY LAUNCH FEE
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

Daily Launch Fee Offered	Would Accept		Would Reject		Total	
	no.	pct.	no.	pct.	no.	pct.
$1	6	46.15	4	10.81	10	20.00
$25	5	38.46	5	13.51	10	20.00
$85	1	7.69	9	24.32	10	20.00
$150	0	0.00	10	27.03	10	20.00
$450	1	7.69	9	24.32	10	20.00
Total	13	100	37	100	50	100

TABLE 53

ACCEPTANCE OR REJECTION OF OFFER TO FORGO ONE FISHING TRIP
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

Dollar Amount Offered	Would Accept		Would Reject		Don't Knot		Total	
	no.	pct.	no.	pct.	no.	pct.	no.	pct.
$1	0	0.00	10	27.78	0	0.00	10	20.00
$25	0	0.00	9	25.00	1	100	10	20.00
$85	2	15.38	8	22.22	0	0.00	10	20.00
$150	5	38.46	5	13.89	0	0.00	10	20.00
$450	6	46.15	4	11.11	0	0.00	10	20.00
Total	13	100	36	100	1	100	50	100

TABLE 54

ACCEPTANCE OR REJECTION OF OFFER TO FORGO ONE FISHING SEASON
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

Dollar Amount Offered	Would Accept		Would Reject		Refused		Total	
	no.	pct.	no.	pct.	no.	pct.	no.	pct.
$1	0	0.00	10	22.22	0	0.00	10	20.00
$250	0	0.00	10	22.22	0	0.00	10	20.00
$850	1	25.00	9	20.00	0	0.00	10	20.00
$1500	1	25.00	8	17.78	1	100	10	20.00
$4500	2	50.00	8	17.78	0	0.00	10	20.00
Total	4	100	45	100	1	100	50	100

TABLE 55

ACCEPTANCE OR REJECTION OF OFFER TO PAY FOR SEASON LICENSE
EXPERIMENTAL VALUATION OF RECREATIONAL FISHING IN HAWAII
SAMPLE SIZE = 50

Dollar Amount Offered	Would Accept		Would Reject		Don't Know		Refused		Total	
	no.	pct.	no.	pct.	no.	pct.	no.	pct.	no.	pct.
$1	8	53.55	1	3.23	0	0.00	1	100	10	20.00
$250	6	40.00	3	9.68	1	33.33	0	0.00	10	20.00
$850	0	0.00	9	29.03	1	33.33	0	0.00	10	20.00
$1500	1	6.67	9	29.03	0	0.00	0	0.00	10	20.00
$4500	0	0.00	9	29.03	1	33.33	0	0.00	10	20.00
Total	15	100	31	100	3	100	1	100	50	100

APPENDIX B

SURVEY INSTRUMENTS AND INSTRUCTIONS

Interviewer _____

Date _____

I.D. Number ☐☐☐

Version ____

OFFICE USE ONLY

"take it or leave it" cell no. 1 2 3 4 5

"bidding" cell no. 1 2

RECREATIONAL FISHING
VALUATION SURVEY

SMS Research
Spring 1983

Hello, I'm _____ from SMS Research, a local research firm, doing a survey about recreational fishing for the National Marine Fisheries Service in Honolulu.

ASK FOR OWNER OF BOAT. IF OWNER NOT AVAILABLE, ASK TO SPEAK TO SKIPPER. CIRCLE PERSON INTERVIEWED BELOW. REPEAT INTRODUCTION IF NECESSARY

owner 1
skipper 2

Did you do any recreational or sport fishing from your boat today? IF NO, TERMINATE.

First, a few questions about your boat.

1. How many feet long is it?

no. of feet . . . . . ☐☐
don't know=98, refused=99

2. For how many years (have you/has the owner) owned this boat?

no. of years. . . . . ☐☐
don't know=98, refused=99

3. (Did you/did he) buy this boat?

yes 1
no 2
don't know. 8
refused 9

4. (SHOW CARD A) How much did the boat cost? Do not include any electronic or fishing equipment that was bought extra. Just give the letter next to the right category.

a. under $1,000 1
b. $1,000 to under $5,000. 2
c. $5,000 to under $10,000 3
d. $10,000 to under $20,000. . . . 4
e. $20,000 to under $30,000. . . . 5
f. $30,000 or more 6
(don't know) 8
(refused). 9

5. What locations do you usually launch your boat from? (WRITE IN)

1) _____

2) _____

3) _____

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____

____

____

6. (SHOW CARD B) Which of these are important to you when you decide where to launch your boat? Just give the letter. (CIRCLE ALL MENTIONS BELOW)

7. Which one of these is the most important thing to you? (CIRCLE ONE BELOW)

	6. important	7. most important
a. closeness to home	1	1
b. closeness to good fishing areas	1	1
c. scenic drive to launching location	1	1
d. closeness to friends and relatives for visits	1	1
e. good launch facilities	1	1
f. good weather	1	1
g. uncrowded launch	1	1
h. good food and beverages stores nearby	1	1

8. On the average, how many gallons of fuel per hour does your engine use while sport fishing in open water? (RECORD TO NEAREST GALLON)

gallons/hour ☐☐
DK=8, ref=9

9. Do you have a commercial fishing license?

yes 1
no 2
refused 9

SKIP TO Q.10 (if no)

9a. Have you sold any of your catch during the last twelve months?

yes 1
no 2
refused 9

10. (SHOW CARD C) Do you keep any log or other record about any of the following things? Just call out the letter. (CIRCLE ALL MENTIONS BELOW)

a. number of fishing trips 1
b. number of persons aboard 1
c. hours at sea 1
d. engine running time 1
e. amount of fish caught 1
f. types of fish caught 1
g. fishing-related costs 1

Now, we are interested in your fishing over the last twelve months.

11. Overall, how many boat fishing trips did you take in Hawaiian waters over the past twelve months? Just give your best estimate.

number of trips ☐☐☐
dk=998, ref=999

12. And overall, what percent of these trips were mainly for offshore recreational fishing or sportfishing? Just give your best estimate.

percent ☐☐☐
dk=998, ref=999

13. On any of these trips in the past year, have you ever fished within half a mile of a fish aggregating buoy?

yes 1
no 2
don't know 3
refused 9

SKIP TO Q.14 (if no)

13a. Overall, on what percent of your fishing trips did you fish within half a mile of a buoy at least part of the time? Give your best guess.

percent ☐☐☐
dk=98, ref=99

14. Which buoys have you fished near by boat in the past year? Could you give me their I.D. letter or a description? (WRITE IN BELOW)

	I.D. letter	description
1)		
2)		
3)		

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15. Suppose you are on a boating trip and find that a fishing spot is crowded. What is the maximum number of additional miles you would travel that day to find an uncrowded spot? Just give your best guess.

no. of miles ☐☐☐
dk=98, ref=99

16. (SHOW CARD D-1)Now I'd like to ask about your fish catch in the last 12 months. For each type of fish listed on this card, please tell me whether you caught any in the last twelve months, how many you caught in that time, what percent you caught within half a mile of a buoy, and what percent was sold for money. Just give your best guess please.

	-1 caught any	-2 number caught	-3 % caught within ½ mile of buoy	-4 % sold
ono	1	☐☐☐☐	☐☐☐	☐☐☐
mahi mahi	1	☐☐☐☐	☐☐☐	☐☐☐
striped marlin	1	☐☐☐☐	☐☐☐	☐☐☐
shark	1	☐☐☐☐	☐☐☐	☐☐☐
		dk=9999 ref=9999	dk=998 ref=999	

FOR QUESTIONS 17 & 19 AND 21 & 22, FOLLOW INTERVIEWER INSTRUCTIONS ON SEPARATE CARD

The ideas mentioned in the following questions are not real, and are not being planned by anyone. They are just to test how valuable recreational or sportfishing is to people. However, please answer each question as if it were a real situation.

17. (SHOW CARD E) Suppose that the day before you planned to go on an offshore sportfishing trip, you got a call from a person who offered you cash if you agreed not to go fishing. If he offered to pay you $ _____, would you agree not to go offshore sportfishing the following day?

yes 1
no 2
don't know. 8
refused 9

18. (SHOW CARD F) Suppose that instead of offering a specific amount of money, he let you decide how much you would have to have. What is the smallest amount of money that would persuade you not to go offshore fishing as planned? (GET ESTIMATE TO NEAREST DOLLAR)

$ ☐☐☐☐
dk=9998, ref=9999

19. (SHOW CARD G) Suppose that the day before a fishing trip you hear that a new law requires you to pay a launching fee everytime you take your boat out fishing. If the charge was set at $_____ per launch, would you pay the fee and go fishing as you had planned?

yes 1
no 2
don't know. 8
refused 9

14. Which buoys have you fished near by boat in the past year? Could you give me their I.D. letter or a description? (WRITE IN BELOW)

	I.D. letter	description
1)		
2)		
3)		

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15. Suppose you are on a boating trip and find that a fishing spot is crowded. What is the maximum number of additional miles you would travel that day to find an uncrowded spot? Just give your best guess.

no. of miles [ ][ ][ ]
dk=98, ref=99

16. (SHOW CARD D-2)Now I'd like to ask about your fish catch in the last 12 months. For each type of fish listed on this card, please tell me whether you caught any in the last twelve months, how many you caught in that time, what percent you caught within half a mile of a buoy, and what percent was sold for money. Just give your best guess please.

	-1 caught any	-2 number caught	-3 % caught within ½ mile of buoy	-4 % sold
ahi	1	[ ][ ][ ][ ]	[ ][ ][ ]	[ ][ ][ ]
blue marlin	1	[ ][ ][ ][ ]	[ ][ ][ ]	[ ][ ][ ]
spearfish	1	[ ][ ][ ][ ]	[ ][ ][ ]	[ ][ ][ ]
bottom fish	1	[ ][ ][ ][ ]	[ ][ ][ ]	[ ][ ][ ]
		dk=9998 ref=9999	dk=998 ref=999	

FOR QUESTIONS 17 & 19 AND 21 & 22, FOLLOW INTERVIEWER INSTRUCTIONS ON SEPARATE CARD

The ideas mentioned in the following questions are not real, and are not being planned by anyone. They are just to test how valuable recreational or sportfishing is to people. However, please answer each question as if it were a real situation.

17. (SHOW CARD E) Suppose that the day before you planned to go on an offshore sportfishing trip, you got a call from a person who offered you cash if you agreed not to go fishing. If he offered to pay you $ _____, would you agree not to go offshore sportfishing the following day?

yes 1
no 2
don't know. 8
refused 9

18. (SHOW CARD F) Suppose that instead of offering a specific amount of money, he let you decide how much you would have to have. What is the smallest amount of money that would persuade you not to go offshore fishing as planned? (GET ESTIMATE TO NEAREST DOLLAR)

$ [ ][ ][ ][ ]
dk=9998, ref=9999

19. (SHOW CARD G) Suppose that the day before a fishing trip you hear that a new law requires you to pay a launching fee everytime you take your boat out fishing. If the charge was set at $_____ per launch, would you pay the fee and go fishing as you had planned?

yes 1
no 2
don't know. 8
refused 9

14. Which buoys have you fished near by boat in the past year? Could you give me their I.D. letter or a description? (WRITE IN BELOW)

	I.D. letter	description
1)		
2)		
3)		

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15. Suppose you are on a boating trip and find that a fishing spot is crowded. What is the maximum number of additional miles you would travel that day to find an uncrowded spot? Just give your best guess.

no. of miles ☐☐☐
dk=98, ref=99

16. (SHOW CARD D-3)Now I'd like to ask about your fish catch in the last 12 months. For each type of fish listed on this card, please tell me whether you caught any in the last twelve months, how many you caught in that time, what percent you caught within half a mile of a buoy, and what percent was sold for money. Just give your best guess please.

	-1 caught any	-2 number caught	-3 % caught within ½ mile of buoy	-4 % sold
aku	1	☐☐☐☐	☐☐☐	☐☐☐
black marlin	1	☐☐☐☐	☐☐☐	☐☐☐
sailfish	1	☐☐☐☐	☐☐☐	☐☐☐
		dk=9999 ref=9999	dk=998 ref=999	

FOR QUESTIONS 17 & 19 AND 21 & 22, FOLLOW INTERVIEWER INSTRUCTIONS ON SEPARATE CARD

The ideas mentioned in the following questions are not real, and are not being planned by anyone. They are just to test how valuable recreational or sportfishing is to people. However, please answer each question as if it were a real situation.

17. (SHOW CARD E) Suppose that the day before you planned to go on an offshore sportfishing trip, you got a call from a person who offered you cash if you agreed not to go fishing. If he offered to pay you $ _____, would you agree not to go offshore sportfishing the following day?

yes 1
no 2
don't know. 8
refused 9

18. (SHOW CARD F) Suppose that instead of offering a specific amount of money, he let you decide how much you would have to have. What is the smallest amount of money that would persuade you not to go offshore fishing as planned? (GET ESTIMATE TO NEAREST DOLLAR)

$ ☐☐☐☐
dk=9998, ref=9999

19. (SHOW CARD G) Suppose that the day before a fishing trip you hear that a new law requires you to pay a launching fee everytime you take your boat out fishing. If the charge was set at $_____ per launch, would you pay the fee and go fishing as you had planned?

yes 1
no 2
don't know. 8
refused 9

20. (SHOW CARD H) Hawaii does not charge a daily launch fee. Suppose, however, that one was being planned. What do you think would be a fair price to charge fishermen to fish for one day offshore? (GET TO NEAREST DOLLAR)

per day $ ☐☐☐☐
dk=9999, ref=9999

21. (SHOW CARD I) Suppose that you were going to fill up your boat's fuel tank to go out fishing the next day. You hear that a new tax has been placed on fuel used for sportfishing. Would you go ahead and buy fuel so that you could go fishing if the tax increased the cost of a fishing trip by $_____? (GET TO NEAREST DOLLAR)

final maximum acceptable tax amount $ ☐☐☐☐
dk=9999, ref=9999

22. (SHOW CARD J) Finally, imagine that the day before you are planning to go offshore sportfishing, you find out that all sportfishing trips for the next day will have to be cancelled because of top secret Navy operations. However, you will get a cash reward to make up for the trouble caused you. Would you be satisfied with a cash reward of $ _____ if you could not go offshore sportfishing as planned? (GET TO NEAREST DOLLAR)

final minimum acceptable tax amount $ ☐☐☐☐
dk=9999, ref=9999

Finally, just a few questions for statistical purposes.

23. (SHOW CARD S) Which of the following categories includes your age? Just say the letter.

a. 17 or less	1
b. 18 to 24	2
c. 25 to 34	3
d. 35 to 44	4
e. 45 to 54	5
f. 55 to 64	6
g. 65 or over	7
(refused)	9

24. What is the zip code for the area where you live? 96 ☐☐☐

25. Do you happen to be employed right now?

yes	1
no	2
refused	9

SKIP TO Q.26

25a. What is your main job, that is, the one that makes the most income? (DESCRIBE BELOW)

_____

26. (SHOW CARD T) Which category includes the annual income you get from your main job? Just say the letter.

a. $5,000 or less	1
b. $5,001 to $10,000	2
c. $10,001 to $15,000	3
d. $15,001 to $20,000	4
e. $20,001 to $30,000	5
f. $30,001 to $40,000	6
g. more than $40,000	7
(refused)	9

27. (RECORD, DO NOT ASK) Sex of resondent

male	1
female	2

Could I just have your first name only and telephone number, in case my office wants to make sure I talked with you? Thank you very much for your help.

Name _____ Telephone _____

Interviewer _____

Date _____

I.D. Number ☐☐☐

Version ____

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"take it or leave it" cell no. 1 2 3 4 5

"bidding" cell no. 1 2

RECREATIONAL FISHING VALUATION SURVEY

SMS Research
Spring 1983

Hello, I'm _____ from SMS Research, a local research firm, doing a survey about recreational fishing for the National Marine Fisheries Service in Honolulu.

ASK FOR OWNER OF BOAT. IF OWNER NOT AVAILABLE, ASK TO SPEAK TO SKIPPER. CIRCLE PERSON INTERVIEWED BELOW. REPEAT INTRODUCTION IF NECESSARY

owner 1
skipper 2

Did you do any recreational or sport fishing from your boat today? IF NO, TERMINATE.

First, a few questions about your boatfishing trip today.

1. How many hours were you out in the boat today? (GET ANSWER TO NEAREST HOUR)

hours ☐☐
dk=98, ref=99

2. How many miles did you travel in your boat before you actually started fishing?

miles ☐☐☐
dk=98, ref=99

3. In general, does the distance you travel before you start fishing depend on where you launch the boat from?

yes 1
no. 2
don't know. 8
refused 9

4. On today's trip, did you use your boat for any other kind of fishing besides recreational or sport fishing?

yes 1
no 2
refused 9

SKIP TO Q.5

4a. (IF YES) What was that? (WRITE IN)

_____

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_____

5. (SHOW CARD K) What were your expenses for each of these items on this trip? Just give your best guess to the nearest dollar.

a. fuel and oil for boat. . $ ☐☐☐

b. fuel and oil for truck or car . . . . . $ ☐☐☐

c. ice. . . . . $ ☐☐☐

d. bait . . . . . $ ☐☐☐

e. food . . . . . $ ☐☐☐

f. beverages. . . . . $ ☐☐☐

g. lodging. . . . . $ ☐☐☐

h. launch fees. . . . . $ ☐☐☐

6. Did more than one person share the cost of those expenses for this trip? (IF "NO," RECORD "1" BELOW) (IF "YES," ASK) How many people in total shared the expensed for this trip? (RECORD BELOW)

no. of people ☐☐
dk=98, ref=99

Now, some questions about fishing in general.

7. On the average, how much is spent per month for...(READ ITEMS) (GET ESTIMATE TO NEAREST DOLLAR)

the payment on this boat . . . . . $ ☐☐☐

mooring this boat. . . . . $ ☐☐☐

dk=998, ref=999

8. (SHOW CARD L-1) Over the past twelve months, what is the total amount you probably spent for each of the following items? Just give your best estimate. (READ LIST AND RECORD BELOW) (GET ESTIMATE TO NEAREST DOLLAR)

a. lures . . . . . $ ☐☐☐☐

b. fishing line. . . . . $ ☐☐☐☐

c. nets. . . . . $ ☐☐☐☐

d. gaffs . . . . . $ ☐☐☐☐

e. boat insurance. . . . . $ ☐☐☐☐

f. licenses. . . . . $ ☐☐☐☐

g. fishing club dues . . . . . $ ☐☐☐☐

h. fishing rods. . . . . $ ☐☐☐☐

i. fishing reels . . . . . $ ☐☐☐☐

j. coolers . . . . . $ ☐☐☐☐

9. Of those expenses, how much money in total did you spend on items bought directly from supply sources outside the state of Hawaii, such as through mail-order catalogues? Just give us your best guess. (RECORD BELOW TO NEAREST DOLLAR)

$ ☐☐☐☐

5. (SHOW CARD K) What were your expenses for each of these items on this trip? Just give your best guess to the nearest dollar.

a. fuel and oil for boat. . $ [ ][ ][ ]

b. fuel and oil for truck or car . . . . . $ [ ][ ][ ]

c. ice. . . . . $ [ ][ ][ ]

d. bait . . . . . $ [ ][ ][ ]

e. food . . . . . $ [ ][ ][ ]

f. beverages. . . . . $ [ ][ ][ ]

g. lodging. . . . . $ [ ][ ][ ]

h. launch fees. . . . . $ [ ][ ][ ]

6. Did more than one person share the cost of those expenses for this trip? (IF "NO," RECORD "1" BELOW) (IF "YES," ASK) How many people in total shared the expensed for this trip? (RECORD BELOW)

no. of people [ ][ ]
dk=98, ref=99

Now, some questions about fishing in general.

7. On the average, how much is spent <u>per month</u> for...(READ ITEMS) (GET ESTIMATE TO NEAREST DOLLAR)

the payment on this boat . . . . . $ [ ][ ][ ]

mooring this boat. . . . . $ [ ][ ][ ]

dk=998, ref=999

8. (SHOW CARD L-2) Over the past <u>twelve months</u>, what is the <u>total amount</u> you probably spent for each of the following items? Just give your best estimate. (READ LIST AND RECORD BELOW) (GET ESTIMATE TO NEAREST DOLLAR)

k. safety equipment. . . . . $ [ ][ ][ ][ ]

l. radio for boats . . . . . $ [ ][ ][ ][ ]

m. navigation equipment. . . . . $ [ ][ ][ ][ ]

n. engine repair . . . . . $ [ ][ ][ ][ ]

o. hull repair . . . . . $ [ ][ ][ ][ ]

p. fishing equipment repair. . . . $ [ ][ ][ ][ ]

q. tournament fees . . . . . $ [ ][ ][ ][ ]

r. other marine hardware . . . . . $ [ ][ ][ ][ ]

s. haul-out charges. . . . . $ [ ][ ][ ][ ]

t. repairs on trailer. . . . . $ [ ][ ][ ][ ]

9. Of those expenses, how much money in total did you spend on items bought directly from supply sources outside the state of Hawaii, such as through mail-order catalogues? Just give us your best guess. (RECORD BELOW TO NEAREST DOLLAR)

$ [ ][ ][ ][ ]

We would like to ask about how important recreational or sport fishing is to you.

10. Has the amount of time you spend sport fishing in a boat increased, decreased, or stayed the same since you first began offshore fishing in Hawaii?

increased 1
decreased 2
stayed the same 3
don't know. 8
refused 9

11. If for some reason you couldn't go sport fishing by boat in Hawaii anymore, would you miss it a lot, somewhat, or only a little?

a lot 1
somewhat. 2
only a little 3
don't know. 8
refused 9

12. If you couldn't do any boat fishing for sport in Hawaii anymore, what other things would you do instead? (PROBE) Anything else? (WRITE IN BELOW)

1) _____

2) _____

3) _____

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____

____

____

13. How much more satisfying would sport fishing offshore be for you if the launching areas and fishing areas were less crowded than they are now--would you be a lot more satisfied, somewhat more satisfied, or only a little more satisfied?

a lot 1
somewhat. 2
only a little 3
no difference 4
don't know. 8
refused 9

14. Suppose a tropical storm wiped out a lot of the fish in Hawaii, and therefore on each boat trip you could only catch about half as many of the fish as you can now. Would you take more boat trips or fewer boat trips than you do now? (RECORD BELOW) (IF MORE OR FEWER, ASK) By about what percent would your number of boat trips go (up/down)? Just give your best guess.

more. 1
fewer 2
about the same 3
don't know. 8
refused 9

percent change ☐☐☐
dk=998, ref=999

FOR QUESTIONS 15 & 17 AND 19 & 20, FOLLOW INTERVIEWER INSTRUCTIONS ON SEPARATE CARD

The ideas mentioned in the following questions are not real, and are not being planned by anyone. They are just to test how valuable recreational or sportfishing is to people. However, please answer each question as if it were a real situation.

15. (SHOW CARD M) Suppose someone offered you money if you agreed not to fish offshore at all during the rest of 1983. You would sign a legal contract that would stop you from going offshore fishing during 1983, although you could fish from shore or do other sport activities. If the money offered you was $_____, would you agree to the deal and sign the contract?

yes 1
no 2
don't know 8
refused 9

16. (SHOW CARD N) Suppose that instead of offering you a certain amount of money, he let you decide how much you would have to have. What is the smallest amount of money that would persuade you to agree not to go fishing offshore during all the rest of 1983? (GET ESTIMATE TO NEAREST DOLLAR)

$ [ ][ ][ ][ ][ ]
dk=99998, ref=99999

17. (SHOW CARD O) Suppose a new law required offshore sport fishermen to purchase a fishing license. It would allow you to fish whenever you wish in 1983. Without a license, you could not fish offshore at all. You would, however, be able to fish from the shore or do other sport activities. If the annual fee was set at $_____ , would you purchase the license to be able to fish offshore during 1983?

yes 1
no 2
don't know. 8
refused 9

18. (SHOW CARD P) Hawaii does not require offshore fishermen to purchase fishing licenses. But, suppose that a law requiring annual licenses was being planned. What do you think would be a fair price to charge fishermen for a license that allows them to fish offshore for one year? (GET ESTIMATE TO NEAREST DOLLAR)

per year $ [ ][ ][ ][ ][ ]
dk=9998, ref=9999

19. (SHOW CARD Q) Suppose that the Federal Government just passed a law that required all boat users to pay an annual user fee. Would you go ahead and pay the annual tax so that you could go offshore fishing in 1983 if the amount which you had to pay was set at $(INSERT DOLLAR AMOUNT AND BEGIN BIDDING PROCEDURE)?

final maximum
acceptable tax $ [ ][ ][ ][ ][ ]
dk=99998, ref=99999

20. (SHOW CARD R) Finally, suppose that the government asked you if you would stop fishing for the rent of 1983. In return, you will receive a cash award. Would you go along and not go offshore sportfishing in 1983 if the cash award was $ (INSERT DOLLAR AMOUNT AND BEGIN BIDDING PROCEDURE)?

final minimal
acceptable reward $ [ ][ ][ ][ ][ ]
dk=99998, ref=99999

Finally, just a few questions for statistical purposes.

21. (SHOW CARD S) Which of the following categories includes your age? Just say the letter.

a. 17 or less 1
b. 18 to 24 2
c. 25 to 34 3
d. 35 to 44 4
e. 45 to 54 5
f. 55 to 64 6
g. 65 or over 7
(refused) 9

22. How many days this particular trip did you stay in the Waianae area?

[ ]

23. Do you happen to be employed right now?

yes 1
no 2
refused 9

SKIP TO Q.24

23a. What is your main job, that is, the one that makes the most income? (DESCRIBE BELOW)

_____ 6

24. (SHOW CARD T) Which category includes the annual income you get from your main job? Just say the letter.

a. $5,000 or less 1
b. $5,001 to $10,000. 2
c. $10,001 to $15,000 3
d. $15,001 to $20,000 4
e. $20,001 to $30,000 5
f. $30,001 to $40,000 6
g. more than $40,000 7
(refused). 9

25. (RECORD, DO NOT ASK) Sex of respondent

male 1
female. 2

Could I just have your first name only and telephone number, in case my office wants to make sure I talked with you? Thank you very much for your help.

Name _____ Telephone _____

Interviewer Instructions

Sub Sample I

Q.17 "Take it or leave it"

You should insert a dollar ($) value for this question according to the following scale:

Cell #	Dollar Values $
1	$ 1.00
2	25.00
3	85.00
4	150.00
5	450.00

The appropriate cell number to use is determined by the cell number assigned at the top right-hand portion of the first page

Q.19 Use the same scale as for Q.17. The cell number assigned should be the same for both Q's 17 and 19 on any one questionnaire.

Qs.21/22 These are "bidding" type questions. The dollar amount to start at again is determined by the cell number assigned at the top right-hand portion of the first page. You will have the respondent bid either up or down depending on what dollar amount you start at and the respondent's acceptance to each subsequent amount. The initial bids are as follows:

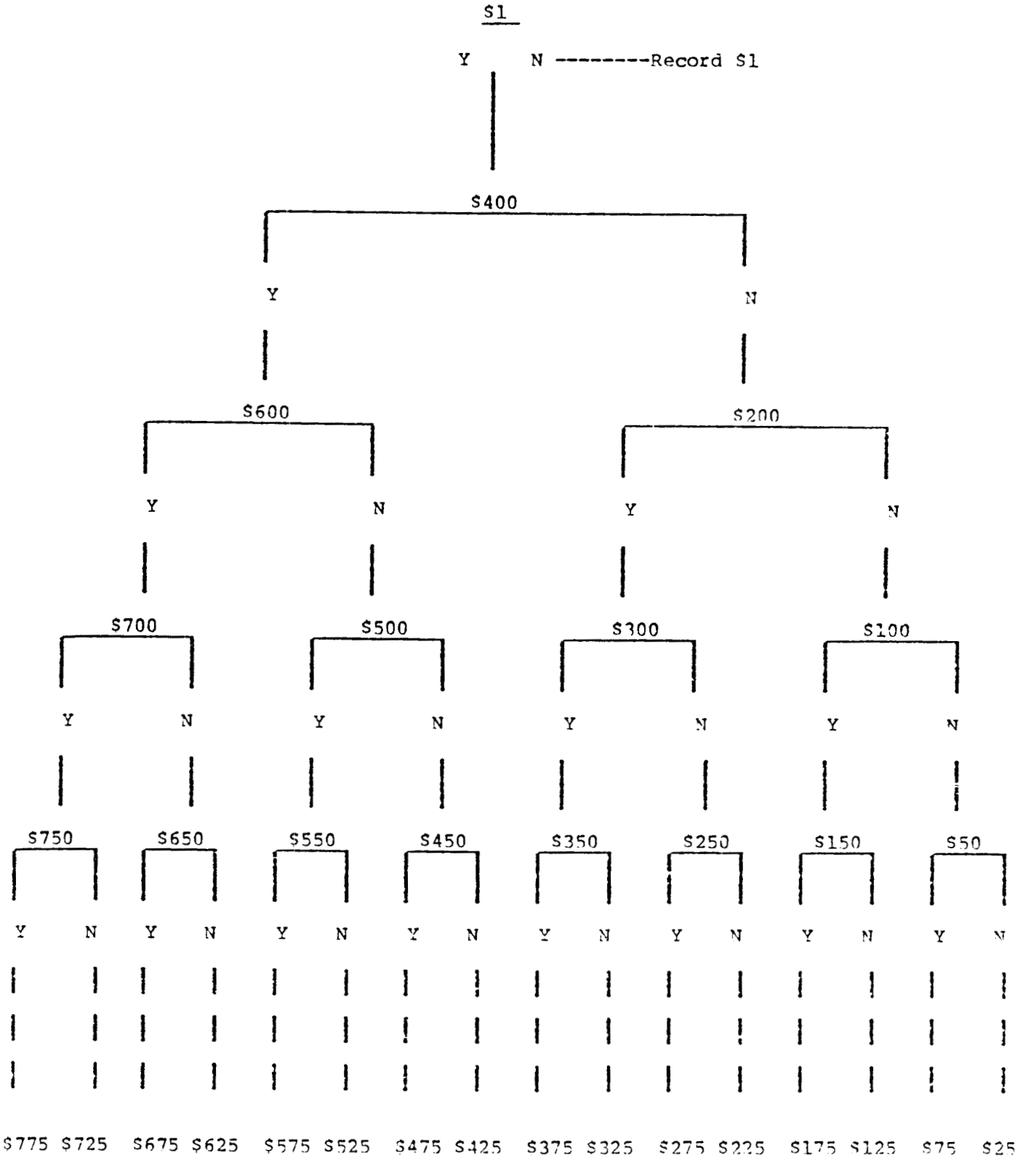
Cell #	Initial Bid
1	$ 1.00
2	800.00

The lowest amount you will record is $1 and the highest is $800. Run through four levels of bids before stopping unless the respondent answers "no" for $1 or "yes" for $800 in the initial bid amount.

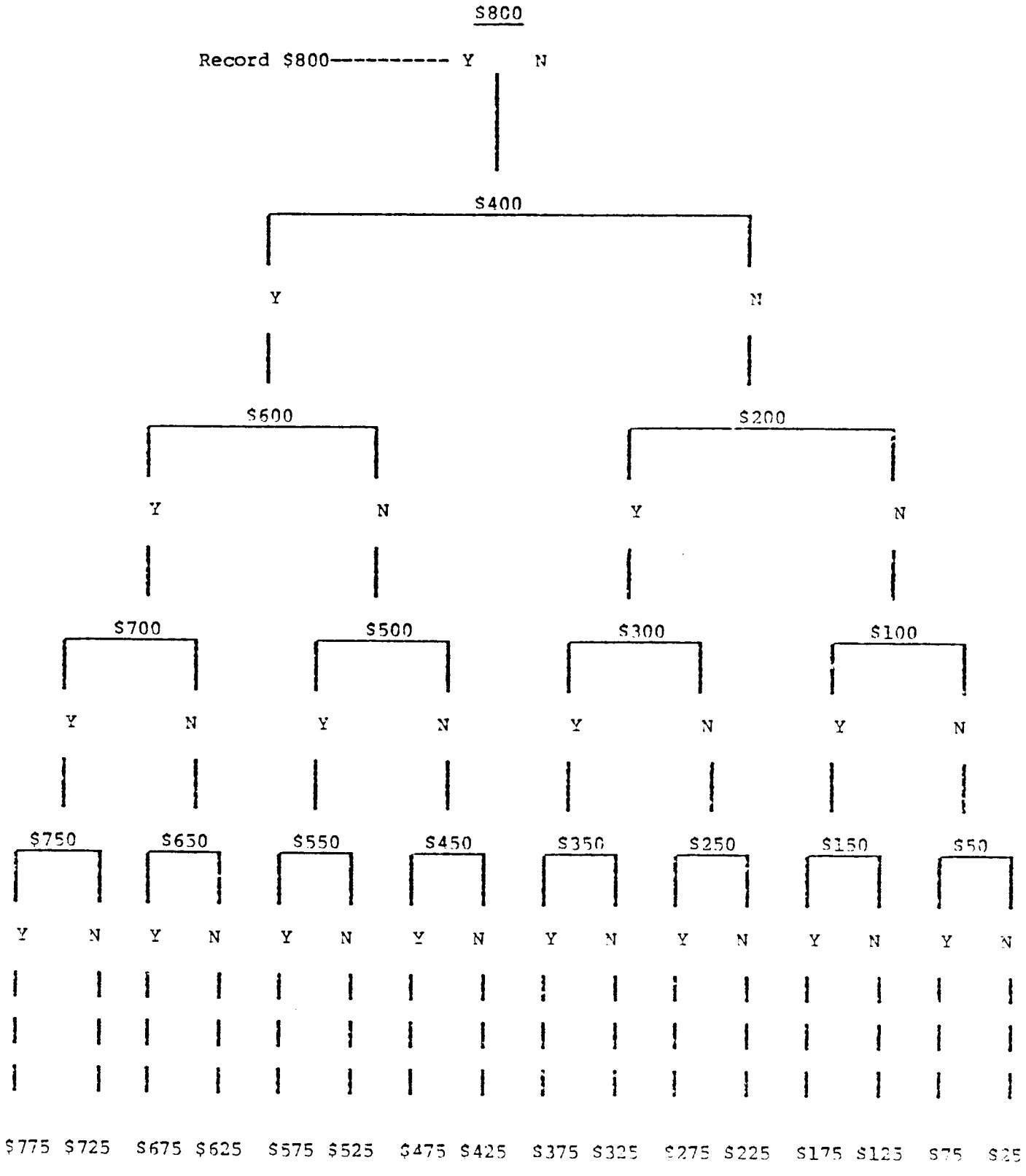
The bidding process is illustrated on the following page. The amounts to be recorded are the midpoints between the last "yes" amount and the last "no" amount. These amounts are indicated by the dotted lines leading to the appropriate "record" instruction.

The initial bid prices for Qs. 21/22 should be the same for an individual questionnaire.

Sub Sample I, Cell #1



Sub Sample I, Cell #2



Interviewer Instructions

Sub Sample II

Qs.15 "Take it or leave it"

You should insert a dollar ($) value for this question according to the following scale:

Cell #	Dollar Values $
1	$ 1.00
2	250.00
3	850.00
4	1500.00
5	4500.00

The appropriate cell number to use is determined by the cell number assigned at the top right-hand portion of the first page

Q.17 Use the same scale as for Q.17. The cell number assigned should be the same for both Q's 17 and 19 on any one questionnaire.

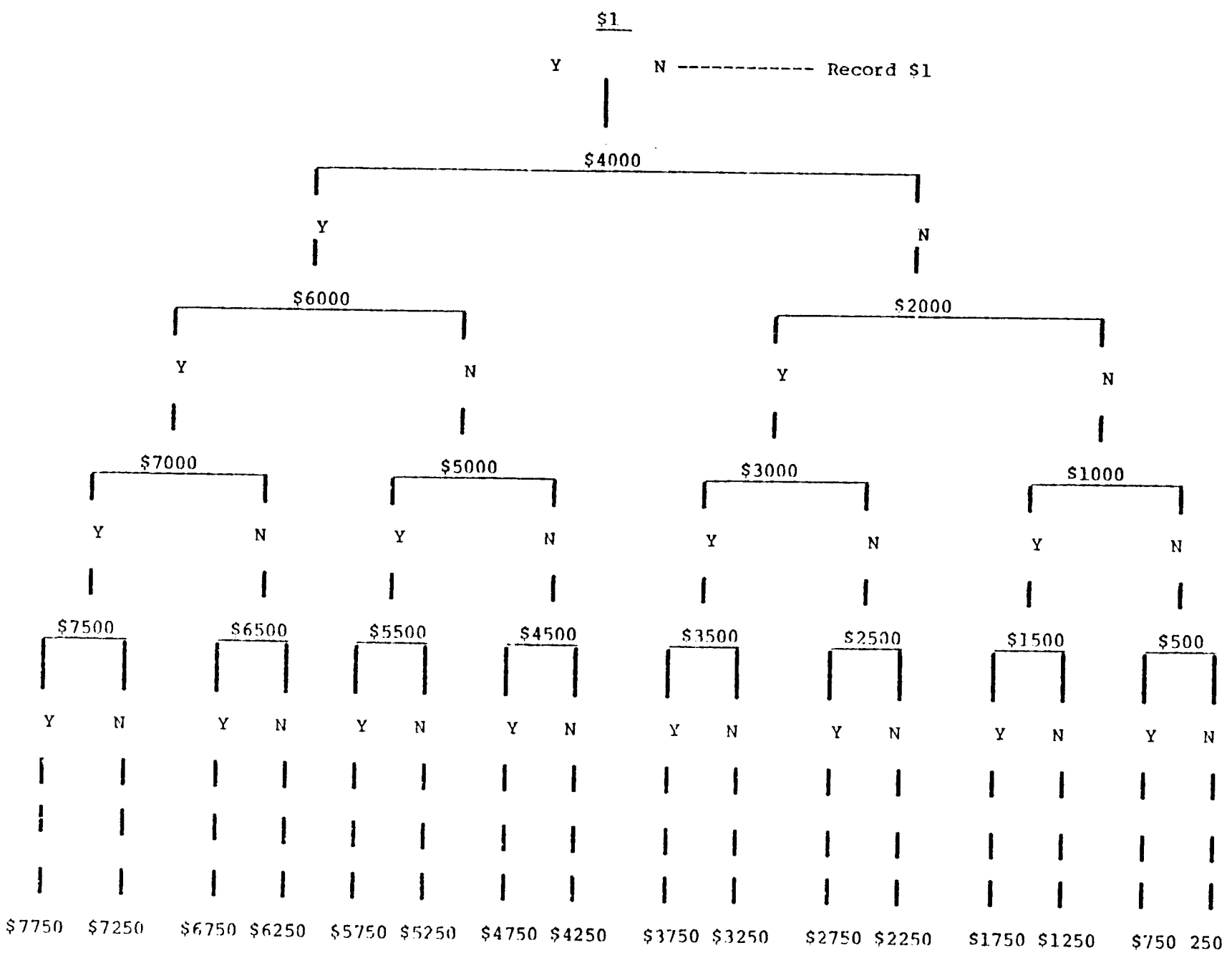
Qs.19/20 These are "bidding" type questions. The dollar amount to start at again is determined by the cell number assigned at the top right-hand portion of the first page. You will have the respondent bid either up or down depending on what dollar amount you start at and the respondent's acceptance to each subsequent amount. The initial bids are as follows:

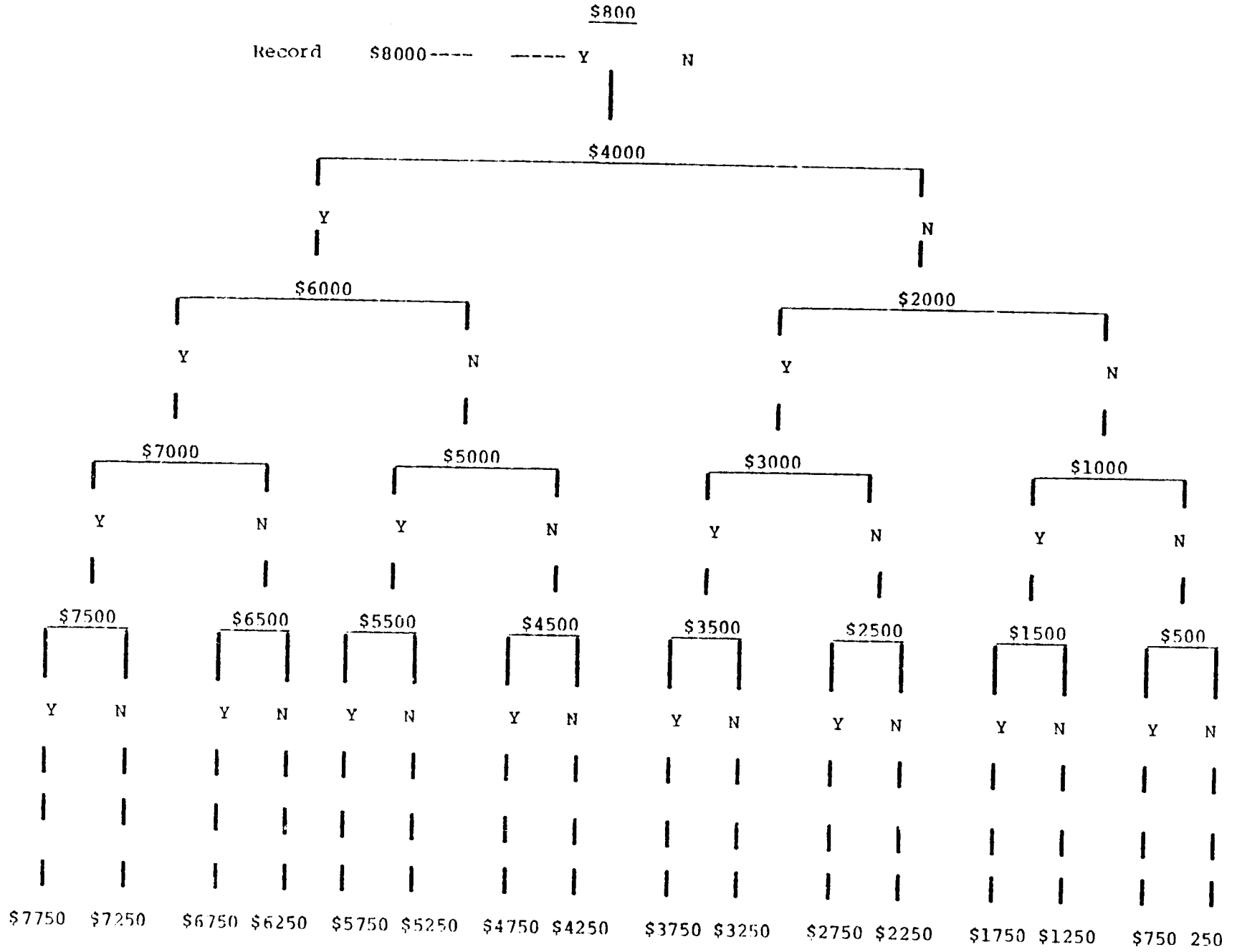
Cell #	Initial Bid
1	$ 1.00
2	8000.00

The lowest amount you will record is $1 and the highest is $8000. Run through four levels of bids before stopping unless the respondent answers "no" for $1 or "yes" for $8000 in the initial bid amount.

The bidding process is illustrated on the following page. The amounts to be recorded are the midpoints between the last "yes" amount and the last "no" amount. These amounts are indicated by the dotted lines leading to the appropriate "record" instruction.

The initial bid prices for Qs. 19/20 should be the same for an individual questionnaire.


$1
Y
N ---------- Record $1
$4000
Y
N
$6000
$2000
Y
N
Y
N
$7000
$5000
$3000
$1000
Y
N
Y
N
Y
N
Y
N
$7500
$6500
$5500
$4500
$3500
$2500
$1500
$500
Y N Y N Y N Y N Y N Y N Y N Y N
$7750 $7250 $6750 $6250 $5750 $5250 $4750 $4250 $3750 $3250 $2750 $2250 $1750 $1250 $750 250


$800
Record
$8000----
----- Y
N
$4000
Y
N
$6000
$2000
Y
N
Y
N
$7000
$5000
$3000
$1000
Y
N
Y
N
Y
N
Y
N
$7500
$6500
$5500
$4500
$3500
$2500
$1500
$500
Y N Y N Y N Y N Y N Y N Y N Y N
$7750 $7250 $6750 $6250 $5750 $5250 $4750 $4250 $3750 $3250 $2750 $2250 $1750 $1250 $750 250

APPENDIX C

Results of Statistical Tests Concerning Differences Between Subsamples

Variable	Value Observed Subsample I (P1)	Value Observed Subsample II (P2)	T-Value HO: P1=P2[1]
% owner	78	88	1.34
% male	98	100	1.01
% 18-24 years	8	2	1.38
% 25-34 years	28	28	0
% 35-44 years	40	44	.41
% 45-54 years	16	18	.258
% 55-64 years	6	6	0
% 65 or over	2	2	0
% employed	80	88	1.09
% professional	15	25	.63
% clerical	7	2	1.21
% farm/ fish	2	2	0
% service	20	18	.25
% machine	10	11	.16
% benchwork	5	0	1.62
% structural	30	30	0
% processing	0	2	1.01
% miscellaneous	10	9	.17
% 5000 or less	0	4	1.44
% 50001 to 10000	4	2	.53
% 10,001 to 15,000	2	6	1.02
% 15,001 to 20,000	14	10	.62
% 20,001 to 30,000	34	38	.41
% 30,001 to 40,000	24	18	.73
% more than 40,000	6	2	1.02

[1] T = (P1-P2) / / [P1(1-P1) / 50] + [P2(1-P2) / 50]
T critical (N=50) 2.01 for 95% confidence level

APPENDIX D

Results of Statistical Tests Concerning Differences Between Mean Bid Outcomes

Value to be Estimated	Starting Bid=$1 mean bid (x1)	standard deviation (s1)	Starting Bid=$800 mean bid (x2)	standard deviation (s2)	Calculated T-Value HO: x1=x2[1]
willingness to pay daily fuel tax	$9(23)	$19	$90(15)	$198	1.57
willingness to accept award not to fish for day	$189(20)	$204	$667(19)	$297	5.83

Estimated	Starting Bid=$1 mean bid (x1)	standard deviation (s1)	Starting Bid=$8000 mean bid (x2)	standard deviation (s2)	T-Value HO: x1=x2[1]
willingness to pay annual user fee	$41(20)	$179	$1,428(7)	$2,918	1.26
willingness to accept award not to fish for a year	$5,176(17)	$2,521	$6,902(17)	$2,607	1.96

[1] $T = (x1 - x2) / \sqrt{[s1^2 / n1] + [s2^2 / n2]}$
T critical 2.01 for 95% confidence level.

Note: Number of observations used to calculate means given in parentheses.